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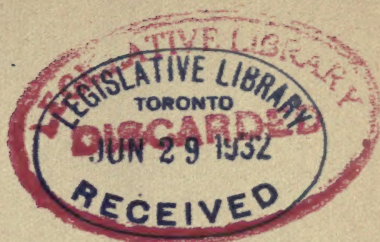
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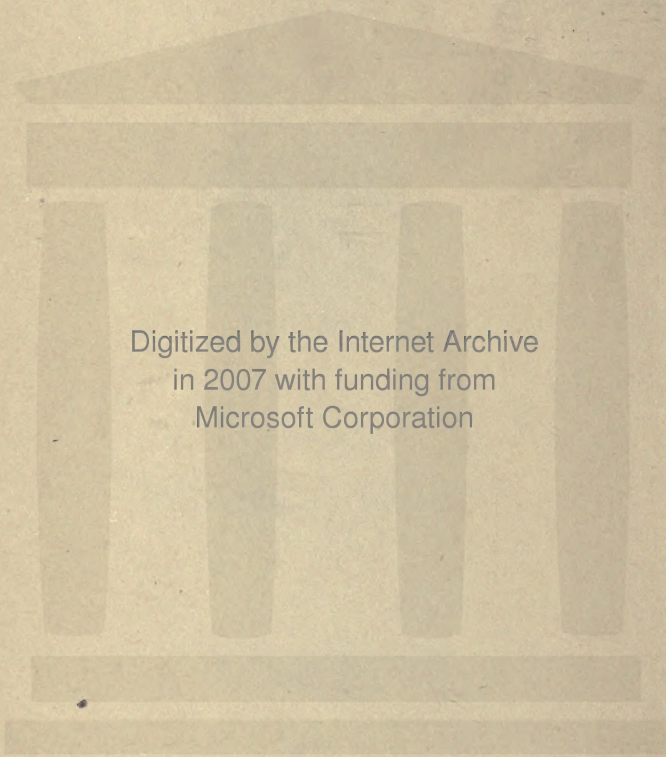


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ECONOMICS OF THE SILK INDUSTRY

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ECONOMICS OF THE SILK INDUSTRY

A STUDY IN INDUSTRIAL ORGANISATION

95153

BY

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INDUSTRIAL ECONOMICS

The same prolific season gives
The sustenance by which he lives,
The Mulberry leaf, a simple store,
That serves him—till he needs no more!

COWPER.

*Thesis approved for the Degree of Doctor of Science (Economics) in the
University of London.*

LONDON

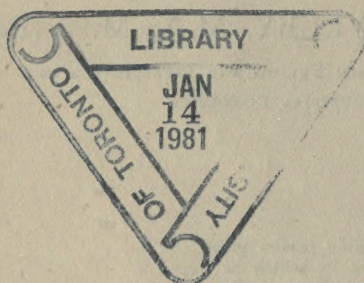
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PREFACE

It is surprising to find that, while a voluminous literature is available on the economic aspects of the cotton industry, comparatively little is known about the economics of the silk industry. In recent years, a few books have been written on the technical growth of silk-manufacturing and silk-spinning, but these do not contain any reference to the influence of particular economic laws on the evolution of the silk industry. Whatever information is available is of a fragmentary character, and is generally contained in the reports of the various commissions appointed, from time to time, to consider the position of the silk-manufacturing industry in this country. Moreover, no attempt has so far been made to present the economic case of the silk industry in a connected form, that is from the production of cocoons to the manufacturing of silk fabrics and other goods made from raw silk.

The object of the present book is to give an economic picture of the whole of the silk industry, and to solve the problems connected with it in the spirit of scientific research. On the one hand, the increasing consumption of raw silk in the principal manufacturing countries of the world demands a careful economic survey of the existing sources of supply, and, on the other, the growing pressure of international competition in the production of silk fabrics attracts attention. It is therefore important that a link should be established between the production and the consumption of the raw material by considering the silk-producing and the silk-manufacturing industries conjointly.

The investigation on which this book is based was commenced in 1916. It is the result of personal observation and inquiry extending over a period of nearly three years, both in this country and in France. In Great Britain I devoted exclusive attention to the study of the manufacturing industry, and collected useful material from all sources, including merchants, brokers, manufacturers, and others interested in the silk industry and trade. During my tour in France I took the opportunity of making a joint economic survey of the silk-producing and the silk-manufacturing industries. This joint study greatly facilitated my work, and I was thus able to discover the connecting links between the processes of production and the processes of manufacturing.

Although I have indicated the sources of information in the body of the book, I should like to mention here that the section dealing with the early history of the industry is based on the Chinese records and Persian manuscripts available for research purposes in the British Museum and the India Office Libraries. As regards the American silk industry, I have received a good deal of help from the publications of Mr. Frank Mason and Professor Taussig. I have also used frequently M. Beauqui's *Histoire Économique de la Soie* for facts concerning the French silk industry.

I might also mention here that the chapters on Distribution of the Industry in Great Britain, The Raw Material, and "Conditioning" of Raw Silks are partly based on the material contained in my *Silk Industry and Trade*. In some cases, a few lines have been incorporated in the present work, in others, the whole chapter has been re-written in the light of more detailed knowledge of the subject.

The preparation of this book has been an arduous task, in which I have to acknowledge, with thanks, the help of merchants, brokers, manufacturers, and managing directors, both in this country and in

France. With regard to the literary presentation of the material which I collected during my investigations, I have to offer my special thanks to Professors Sargent and Lefroy for their constructive criticism and useful suggestions, and to Professor W. R. Scott for his revision and beneficial criticism of the first two parts of the book. It is my pleasant duty to express my thanks to Sir William McCormick for his keen interest in the progress of this work, and to the Executive Committee of the Carnegie Trust and the Secretary of State for India for financial assistance in all matters relating to my investigations.

I cannot fail to express my indebtedness to Messrs. Chabrières, Morel & Co., of Lyons, who have regularly sent me their private circulars containing the monthly quotations of European and Asiatic silks, and have always supplied me with the latest information about the raw silk markets. I hope I shall be forgiven for omitting the full list of the names of those people who have given me help throughout my investigation.

R. C. RAWLLEY.

ROYAL SOCIETIES' CLUB,
LONDON, S.W. 1.
July, 1919.

INTRODUCTION

THE silk-manufacturing industry is rightly regarded as the "queen" of the textile industries. Its products play an important part, not only in daily life as articles of dress, but also in the progress of surgical and electrical sciences. During the European War silk goods found larger channels of consumption, and reached even as far as the trenches in the form of silk cartridge bags. In the aerial warfare, silk was used in the manufacture of balloons and parachutes. As a matter of fact, there was hardly any branch of warfare in which silk goods were not in demand in some form or other. It is therefore obvious that the products of the silk-manufacturing industry are becoming more and more important every day on account of their increasing utility. The vastly increased consumption of silk fabrics in the United States, Great Britain and other progressive countries of the world has given the silk-manufacturing industry a new economic significance.

It has been maintained in one of the recent reports on textile trades that "the silk industry represents the high-water mark of technical attainment among textile industries."¹ In addition to its services to science and society, it affords openings for the development of art and design. Silk, being the most delicate of all textile fibres, makes larger demands upon the artistic perceptions of the designers of textile fabrics, and thus adds to the international wealth of fine arts. It is believed that the spirit of originality

¹ See Report on the Position of the Textile Trades after the War, Cd. 9070, 1918, p. 81.

in the design of textile fabrics would suffer a death-blow if the higher branches of the silk industry were allowed to die out in Great Britain.¹ On this ground the silk industry must be regarded as one of the "key industries."

After having realised the economic importance of the silk-manufacturing industry, we are inclined to ask: What is the fundamental basis of this highly-prized industry? The answer to this question leads us to a consideration of the raw material on which the entire life of the various branches of the silk industry depends.

The raw material is the initial textile fibre, known as the raw silk. This initial fibre is obtained from the silkworm, the result of whose weary toil gives us the foundation of our silk structure, and the poetry of whose life becomes the source of the artist's inspiration. The little insect is not without a history and a romance. It possesses both, and it is in the laying open of these that we discover the struggles of the ancient nations for preserving the mysterious silkworm within their dominions, and for keeping to themselves the culture and the breeding of an insect whose work had already crossed their borders.

In the present volume we have made an attempt to give an economic analysis of the whole of the silk industry. But before attacking the problems relating to the production and consumption of the raw material, we found it necessary to trace the early development of silk production in India and the Far East. The early history of the silk-producing industry has long remained in obscurity, and therefore it was possible to give only a brief sketch of the situation as it existed before the introduction of the silkworm into Europe.

In the second section of this book we have discussed the principal factors which form the economic

¹ See Report on the Position of the Textile Trades after the War, Cd. 9070, 1918, p. 81.

environment of the silk-producing industry. Here we have indicated the importance of the part played by nature in production, and have also dwelt upon the suitability of economic conditions in the silk-producing areas.

The economic environment leads us in logical sequence to the production of raw silk. This part of the subject presents a number of interesting economic problems. In the first place, the silk-producing industry possesses three independent branches, each of which, though inter-related to the other two, forms a separate economic entity. The production of the seed, that is the silkworm's eggs, is an independent branch involving functions which are entirely different from those involved in the production of cocoons. Again, the reeling branch of the industry has its own peculiarities, and possesses features which are more similar to manufacturing than to producing processes. In the second place, the organisation of the silk-producing industry involves complicated labour problems, on account of the vast difference in the economic conditions between the Continental and the Eastern silk-producing countries. In the third place, the introduction of scientific methods in the silk-producing industry has greatly affected the scope of the older forms of production, and has consequently led to new problems of industrial organisation. All these and other problems connected with the production of raw silk have been treated in the third section of this book.

The next significant point in our inquiry is the consumption of raw silk and its by-product. This at once takes us to an economic study of the silk-manufacturing and silk-spinning industries. It might be observed here that the operation of specific economic laws is much more complicated in these two industries than in the silk-producing industry. The production of raw silk represents the economic

activities of the agricultural or semi-agricultural communities, and is therefore governed by comparatively simple economic laws ; but the manufacturing of silk fabrics represents a highly advanced stage of industrialism, which demands the full co-operation of the higher arts of civilisation, such as the arts of spinning, weaving, dyeing, finishing and designing. It is due principally to these demands that the manufacturing industry displays complicated economic features.

In the fourth section, after a preliminary discussion on the relative importance of the consumption of raw silk in the principal silk-manufacturing countries of the world, we have taken the British silk industry as an example to illustrate the working of the general economic principles in the production of silk fabrics and other goods made from the raw silk thread. The problems of localisation and the forms of industrial organisation have been considered in the light of the economic conditions which rendered possible the localisation of the different branches of the British silk industry in different manufacturing areas. The scattered character of the British silk industry has been contrasted with the concentrated character of the French and the American industries, and some useful conclusions have been drawn from this contrast.

In order to show the importance of the fundamental basis of internal economy in the silk-manufacturing industry (when other factors in production are satisfactory), two chapters have been devoted to the study of the raw material. The first chapter deals with the suitability and the utility of the raw silk thread in the various branches of manufacturing, and explains the effects of a defective raw material on the quality of the manufactured product as well as on the cost of production of that product. The second chapter gives an economic analysis of the silk-spinning industry, and clearly shows how the

presence of extraneous matter in waste silk affects the economic production of spun yarns.

The most important problem in this section is that of foreign competition and its effects on the British silk industry. It has been maintained that the production of silk goods in Great Britain suffers both directly and indirectly from the competition of the Continental silk industries. We have tried to analyse this problem from a purely economic point of view, in order to discover the factors which determine the success of foreign competition. We have also touched upon the principle of comparative cost or "comparative advantage," as Professor Taussig calls it, with a view to showing its inapplicability to the British silk industry. Regardless of the economic controversies, we have pointed out that, so long as silk-manufacturing is regarded as a "key industry" on account of its supreme importance to the other highly prosperous textile industries, it does not come under the influence of the principle of comparative cost, and therefore its preservation is prompted more by its national economic significance than by its productive nature. Further, we have argued that if silk-manufacturing is regarded as a "key industry," and if its preservation is necessary for national reasons, it must be made profitable for those who are engaged in it. This argument has led naturally to a consideration of the advantages of tariff protection enjoyed by the foreign competitors, and to the suggestion of a possible future protection for the British silk industry.

Finally, we come to the commercial organisation of the raw silk trade in the fifth section of this book. As is known to every one conversant with the history of the silk trade, the methods of carrying out commercial transactions in the raw silk markets were very unsatisfactory before the establishment of the public conditioning houses. A very valuable

step towards the improvement of the methods of trading was the introduction of the system of conditioning and testing of raw silks—a movement which has been continually advancing since the closing years of the last century, and has made rapid progress in recent years in the United States. In the first chapter of the last section we have given an account of the various functions of commercial and industrial importance performed by a conditioning house.

In the concluding chapter we have examined the system of marketing and distribution. In order to trace the development of this system, we have given a brief account of the methods of marketing adopted by the East India Company, and have shown how they are related to the present system. The old system of "grading," which has been a subject of controversy for a long time, is again receiving the attention of the silk trade. In our concluding chapter we have pointed out the drawbacks of an arbitrary system of grading, and have advocated the adoption of an international classification of raw silks. In addition to this problem, we have discussed the effects of unrestricted speculation on the raw and waste silk markets, and have indicated the economic functions of the merchant and the broker. The attempted solution of these problems concludes our study of the economics of the silk industry.

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ECONOMICS OF THE SILK INDUSTRY

PART I

CHAPTER I

EARLY HISTORY

" Lo ! where the caterpillar-crop
A golden fruitage bears ;
More useful than the painted fop
Its silken spoil that wears.
Yet still for him they toil, for him they die—
Worm, swathed nymph, and parent butterfly." ¹

C. J. C.

It is an arduous task to lay open in detail the early history of silk culture and manufacture in the East, for want of exact historical data ; but it is possible to trace its development before the Christian era with the help of ancient Chinese and Indian records and traditions. In some cases, the investigator has to refer to the Greek and Roman sources ; in others, groping in the dark, he has to depend upon personal conjecture which is generally based on a few scattered hints derived from the diaries of the early travellers or other popular legends. When these sources fail to throw any light on the subject, recourse is sometimes taken to philological evidence and numismatic confirmation, in which case the origin of the silkworm still remains in the dark, and our inquiry leads us to a quite different consideration—a history of the export trade of silk. In every case, the accuracy of our conclusions is determined by the reliability of the sources from which information is drawn. Even those nations of antiquity who have taken pains to preserve their records in

¹ Quoted from " China Illustrated," Vol. I., p. 56 (1843 edition), by the Rev. G. N. Wright.

writing, owe the stability of their national fame to foreign historians, and it is from these historians that we learn a good deal about ancient industries.

It may not be of any practical interest to the modern economist to make an exhaustive inquiry into the early migration of silk, or to locate the ancient commercial routes by which its export trade was carried on ; but it cannot be denied that the origin of the silkworm and its indigenous presence in an industrial country come within the range of his subject, especially when he has an important industrial problem to solve. It will be shown later that the problem of " local seed " ¹ and the nativity of the silkworm is rather an intricate one, and the development of the silk industry depends, to a certain extent, upon a satisfactory solution of this problem. The question of foreign seed supply is directly related to the " Cost of Production," ² and it is therefore necessary to find out the origin of the silkworm by means of historical research.

The works of Chinese historians of a very early period form a basis for our inquiry. A voluminous ancient literature testifies to the antiquity and great importance of Chinese sericulture, and determines an approximate date of the origin of the silkworm. According to an old tradition, towards the year 2800 B.C. Chin Nong, one of the successors of the Emperor Fo-Hi, invented the plough and other agricultural instruments and taught his subjects the method of cultivating the mulberry.³ This invention led to an abundance of silken cloth.

In the year 2602 B.C. the Emperor Hoan-Ti encouraged the rearing of silkworms. The " General History of China," by P. Mailla, gives an interesting version of the pains taken by the great Prince Hoan-Ti to contribute to the happiness of his people by charging his legitimate wife, Si-Ling-Chi, to examine the silkworms, and to find out means of using

¹ Eggs of the silkworm produced within the area of production.

² See the first chapter in the section on Production for the effect of importing eggs from foreign countries on the cost of production of cocoons.

³ *Cp.* " *Les Origines de la Soie*," by J. B. Giraud, p. 14, British Museum Library.

the thread. The Empress had a large quantity of these insects collected and ordered rearing-houses to be built, and after successive efforts discovered the means of reeling the silk and of employing it to make beautiful garments.¹

Another ancient history entitled *Wai-ki* refers to the benefit which the people derived from the great work of *Si-Ling-Chi*, and mentions that the posterity deified her as the Goddess of Silk Worms.

Later, we find silk mentioned frequently in the *Chou-king*, one of the most ancient historical documents of the Celestial Empire. The exact date of the original document cannot be determined with certainty, but it was restored by Confucius about 479 B.C. Silk is figured mostly in the public ceremonies and funerals of the emperors, as a symbol of due homage by the princes and vassals. In 2200 B.C. we see silk mentioned as one of the tributes brought to the Emperor *Chun-Tien* by the Chiefs of the oriental provinces (province of *Chan-Tong*).

An old record of the following century gives a text on the dyeing of silk goods, planting of the mulberry trees, and rearing of the silkworms in the province of *Yen-Tcheon* (*Chan-Tong*). This and many other records finally locate the birthplace of the Chinese sericultural industry in a region which is actually situated in the province of *Chan-Tong*. The industry was considered to be highly sacred, and special attention was bestowed on it by royal and noble families. The following passage from one of the records shows the attention given by members of the imperial family to the cultivation of the mulberry tree and the raising of the silkworms. "In the last Spring month, the young Empress purifies herself, and offers a sacrifice to the Goddess of Silk Worms. She goes to the fields, situated to the east, and gathers mulberry leaves herself. She forbids the noble ladies and ministers' wives all ornamental dress, and she dispenses with the labours of her waiting-women who sew and embroider, so that they may be able to give all their attention to the raising of silkworms."²

¹ *Cp.* "Culture de Mûriers," by Stanilas Julien.

² *Cp.* "Summary of the Principal Chinese Treatises upon the Culture of the Mulberry and the Rearing of the Silkworms," trans.

4 ECONOMICS OF THE SILK INDUSTRY

Other sources of ancient literature (including legendary accounts and traditions) unanimously point to the antiquity of silk culture in China, and indicate that for many centuries this valuable secret remained confined to the boundaries of the Celestial Empire. This secrecy was partly due to the complete isolation of China from the civilised nations of the Occidental World, and partly to its fundamental laws, which not only prohibited intercourse with strangers but even jealously prevented the emigration of its people. The conquerors of the ancient world hurled their armies against the barriers of perpetual snow and high mountains of Tibet, after they crossed the borders of India, but to their ill-luck they found the eternal chains of the Himalayas too impracticable for an invading army. Under these circumstances the Greek invaders were compelled to limit the sphere of their military activities, and China still continued to be an object of mystery for the Western nations. But the spirit of territorial expansion could not be long resisted owing to certain political changes, and about the year 120 B.C., the famous expedition of General Tchang-Khian was sent to the Western countries to open communications with Persia and India. Hirth explains that these countries were not known to the Chinese previous to that period. "It is said that 'Li-kan and T'ia-Chih are several thousand li west of An-hsi (Parthia).'" This statement must have been based on information brought to China by Tchang-Khian (or Chang Chien), the first explorer of western countries, about 120 B.C., and we are probably safe in assuming that the country of Ta-ts'in (somewhere near India) under its old name Li-kan, was not known to the Chinese previous to that period. Even then, the Chinese probably did not know much more than that Li-kan was the name of a country in the far west, whence it was believed that certain products reached China through the hands of intermediary nations, especially the Parthians, in exchange for large quantities of silk bought up by the merchants of Li-kan. The Chinese were probably aware of the importance of both these coun-

lated from the Chinese by M. Stanislas Julien, pp. 77, 78, 79. Published in 1838.

tries.¹ The result of this expedition was that commercial relations were established between China and Persia through Chinese Tartary.

After the establishment of commercial relations between China and Persia, the export trade in raw silk and piece goods assumed a definite importance, and during the first century B.C., even the distant markets of Southern Europe began to receive Eastern silks. From ancient works on history it appears that the Eastern silks were not generally known in Southern Europe before the time of Julius Cæsar (47 B.C.), "who first displayed a profusion of them in some of those magnificent theatrical spectacles with which he was wont to entertain the populace of Rome." These silks were supposed to be mainly Chinese, and the trade at this time was carried on between the extreme Orient and the West by land.

It is interesting to note here, that India had a share in this international trade both as an active exporting country and as an agent for transferring the goods received from peoples inhabiting Chinese Tartary, who were very keen traders and sent commercial embassies every year to China. The silk trade before this period was mainly a caravan trade by land, and followed one of the two routes²; it went either by Khotan across the Himalayas to Kashmir, Gandhara, and Kabul; or the goods were carried to Kashgar and Yarkand, and thence to Sogdiana and Bactria. The former route was the principal channel of the silk trade in the first century B.C. There are two interesting points about this commercial route; firstly, that Kashmir took an active part in this trade and sometimes added to the commodities from her own stocks for export purposes; secondly, that ultimately the silk passing through these countries found its way to Syria, where it was dyed and reworked for the Roman market. The silk from Kashmir and Kabul sometimes found its way to the head of the Persian Gulf, and was then either carried overland across the desert by way of Palmyra

¹ "China and the Roman Orient," by F. Hirth, p. 137.

² *Journal of the Royal Asiatic Society*, for the year 1912, p. 984 J. Kennedy.

to Syria or transported by water to Leukè Komè at the head of the Red Sea. Palmyra attained an eminent degree of splendour, owing to the vast increase of wealth consequent upon this commercial speculation. The chief traders between India and the Persian Gulf were the Meseinians.

In the beginning of the Christian era and the centuries following, the silk trade changed its channel. The sea route became popular, and instead of following the land route, the traders took advantage of the Indian Ocean for conveying their commodities to the West. Alexandria became the central distributing mart of Southern Europe, and international trade between India and Rome became the source of maritime prosperity for some time. The balance of trade was in India's favour as is shown by Pliny. "At the very lowest computation India, the Seres, and the Arabian Peninsula drain from our empire yearly one hundred million of sesterces, so dearly do we pay for our luxury and our women."¹ Indian commodities formed the major part of this trade, and according to "the Periplus of the Erythræan Sea," silk, whether in the raw state or spun into thread or woven into cloth,² was brought from a great city in the interior of the country called Thina by land and exported from Barygaza and Barbarikon at the mouth of the Indus. But the quantity of silk exported from these ports through the Red Sea, Berenice and Alexandria was comparatively small as silk from China still followed the former route, that is, *viâ* the Persian Gulf to Syria and thence to Rome.

Here it is necessary to divert into a different channel of the present investigation: A very important point that needs elucidation is to find out whether silk culture extended from China to Kashmir and India, or if it developed independently in these countries. The ancient historians do not throw any light on this part of the subject, and, therefore, the only means of settling this point is to refer to the casual evidence at our disposal. The question in itself possesses not only an historical but an industrial importance as well. When we speak of an export trade in raw silk and piece goods

¹ Pliny, XII., 84 (c. 18); McCrindle, "Ancient India," p. 125.

² "Periplus Mari Erythræi," translated by McCrindle, p. 147.

from India to Rome, we are naturally inclined to know more about its origin than is indicated by a reference in ancient history.

The Romans named the country *Sericum* or *Serica*, from which the main bulk of their silk came during the first century B.C., and the first few years of the Christian era. The people of this country were known as the *Seres*,¹ and for many centuries their exact origin was completely enveloped in mystery. The vague and uncertain location of *Serica* may be attributed to more than one reason. In the first place, neither the Greeks nor the Romans had penetrated as far north as the country of the *Seres*, and secondly, there existed no direct commercial relations between these unknown people and the Romans before the Christian era.

The uncertainty of the origin of the *Seres* has long been a matter of historical controversy. The various conceptions put forth by researches of the French and other European scholars of the nineteenth century differ in their lines of argument, and the conclusions arrived at have been based on two principal theories: (1) that the people known as the *Seres* were identical with the Chinese, both because of their eastern position, and because the principal silk manufactures were believed to have been brought from their country²; and (2) that the country inhabited by the *Seres* was Little *Bucharia*.³

It is unnecessary for our present purpose to examine the arguments put forth by the various authors who have devoted attention to this problem, but it will be interesting to refer briefly to their conclusions in order to realise the importance of their views. M. Pardessus, a scholar of repute, in his "*Mémoire sur le commerce de la soie chez les*

¹ The first author who speaks of the *Seres* as a distinct nation is Mela, III. 7. See "*Textrinum Antiquorum*," by James Yates (1843 edition), p. 184 f.n. The author, however, does not give any indication of the country of the *Seres*.

² See Mannert, IV., 6, 6, 7, also Brotier, "*Mémoires de l'Académie des Inscriptions*," tome 46.

³ John Reinhold Forster ("*De Byssos*," pp. 20, 21) thinks that Little *Bucharia* was certainly the ancient *Serica*. Sir John Barrow ("*Travels in China*," pp. 435—438) expresses the view that the *Seres* were not the Chinese.

anciens " strongly holds that China was the original country of silk production ; that the bulk of silk that passed through Kashmir and India came from some northern country. " La soie," he adds, " n'était donc point une production indigène dans l'Inde ; et certes, s'il en était ainsi au II^e et même au VI^e siècle, cet état de choses existait dans les siècles précédents."¹ M. Giraud also maintains in a similar way that silk was originally produced in China and exported to the Western countries.² In support of his argument, he states that the silkworm was first introduced into Khotan by a princess ; that before this period (about 140 B.C.), the silkworm was not known to the people of Central Asia. The story of its introduction is told by Huién Tsiang, a Buddhist pilgrim, and is thus reproduced from M. Abel Remusat's extracts " L'histoire du Khotan, pays situé à une assez grande distance orientale de la Bactriane " ³ :—

" In old time, the people of this country knew nothing about mulberry trees or silkworms. Hearing that their neighbours in the eastern country had them, they sent an embassy to seek for them. At this time the prince of the eastern kingdom kept the secret and would not give the possession of it to any. He kept guard over his territory and would not permit either the seeds of the mulberry or the silkworms' eggs to be carried off. The king of Kustana sent off to seek a marriage union with a princess of the eastern kingdom (China), in token of his allegiance and submission. The king being well-affected to the neighbouring states, acceded to his wish. Then the king of Kustana dispatched a messenger to escort the royal princess and gave the following direction : ' Speak thus to the eastern princess—Our country has neither silk or silken stuffs. You

¹ See " Mémoires de l'Institut Royal de France, Académie des Inscriptions et Belle-Lettres," tome Quinzième MDCCCXLII., p. 20.

² " Les Origines de la Soie," by J. B. Giraud, p. 33. British Museum Library.

³ M. Abel Remusat in " Mémoires de l'Institut Royal de France," p. 19 ; also in Beal's " Buddhist Records of the Western World," pp. 318—319 ; also in M. L. Stein's " Ancient Khotan " ; also in M. Giraud's " Les Origines de la Soie," p. 34.

had better bring with you some mulberry seeds and silkworms, then you can make robes for yourself.'

"The princess, hearing these words, secretly procured the seed of the mulberry and silkworms' eggs and concealed them in her head-dress. Having arrived at the barrier, the guard searched everywhere, but he did not dare to remove the princess's head-dress. Arriving then in the kingdom of Kustana, they stopped on the site afterwards occupied by the Lu-shi; thence they conducted her in great pomp to the royal palace. Here, then, they left the silkworms and mulberry seeds. In the spring-time they set the seeds, and when the time for the silkworms had come they gathered leaves for their food; but from their first arrival it was necessary to feed them on different kinds of leaves, but afterwards the mulberry trees began to flourish. From old time till now this kingdom has possessed silkworms, which nobody is allowed to kill, with a view to take away the silk stealthily."

If we were to rely on this legendary evidence for purposes of historical investigation we might believe that the silkworm did not exist in Khotan before the year 140 B.C. (or perhaps later still, according to some authors), but in so far as the question of period is involved, it is difficult so see how the above legend can offer a satisfactory solution. There is no doubt that sericulture is a subject of great antiquity in Khotan, as is clearly shown by the recent archæological investigations of Stein¹ and others, who have based their claims on actual relics and silken garments discovered during excavations. Further, if Huién Tsiang's account of the introduction of the silkworm is true, the industry, even in his time (about 600 A.D.) was so old as to be credited with a legendary origin.

It is, however, inadmissible, from an historical point of view, to attach particular importance to the information based on legendary accounts, and as the views of the authors

¹ For a full reference to these discoveries, see "Ancient Khotan," by M. L. Stein, p. 133. Baron von Richthofen, and before him Sir H. Yule, first proposed the conjectural localisation of Khotan as Ptolemy's Issedon Sirica. This suggestion cannot be taken up with certainty, as there are no ostensible means of proving the identity.

who maintain that the Seres were identical with the Chinese are more or less conjectural, it is impossible to regard them as conclusive. Moreover, it is always wise to use the secondary evidence with caution. At this point, it would suffice to say that according to the first conception, the silkworm must have been introduced from China into Khotan, and from Khotan to Kashmir and other parts of Northern India.¹ Further, if this be the case, then we must assign to China the "birthplace of the silk industry."

But, as already pointed out, there is a second theory which tends to show that the ancient Serica was identical with Little Bucharía. The line of argument followed to support this view is probably related to the account given by the author of the "*Periplus Mari Erythræi*," who states that raw silk and woven silken goods were brought by land through Bactria to Barygaza from a great city called Thina, lying far towards the north in the interior of Asia.² In his account of the trade route and of the exporting country the author apparently refers to some part of Serica, but to give the country in question a definite geographical position, is simply a matter of speculation. Even if it were granted that the author of the "*Periplus*" refers to Little Bucharía as the country of the Seres, the view expressed in this theory does not change the original position, as it is quite possible that the silkworm was introduced into that country from China long before the time of the author.

So far we have dealt with only one aspect of the problem, without referring to the further extension of silk culture. If we are to suppose that the silkworm was introduced into Khotan from China, the next stage of the investigation is to ascertain whether the Indian silk industry was an independent growth or was simply an extension of the Khotan silk industry.

¹ M. Natalis Rondot holds a similar view. He says "Il est très probable que c'est par le Nord, par le Bactriane, le Cachmyr et le Panjab que l'Inde a reçu le ver à soie." See "*L'Art de la Soie*," p. 310, by N. Rondot.

² *Cp.* "*Texturinum Antiquorum*," by James Yates, p. 204 (1843 edition).

This problem presents two difficulties. In the first place, there is no historical evidence to indicate the introduction of the silkworm into Kashmir or India, and we are not, therefore, in a position to say whether silk culture was an indigenous industry or was brought into the country by foreigners. Secondly, the references to silk in the ancient Hindu literature do not explain the origin of the raw material, and, therefore, do not afford any evidence as to the actual production of the raw silk used in silk manufactures. However, it is possible to trace the history of the silk industry in ancient India by examining the occasional hints given in the ancient literature.

As far as our research takes us we find that no definite information regarding silk is given in the Rig Veda.¹ Several passages in the "Laws of Manu" expressly mention "clothes made of silk"²; this code is supposed to have been written in the thirteenth century B.C. Without entering into the antiquity of Manu's code, we may safely assume that silk garments existed more than a thousand years before the Christian era in India. In the time of the Ramayana and Mahabharata (about 1400 B.C.) cotton, silken and woollen stuffs are constantly mentioned. In the Ramayana, the nuptial presents to Sita, the bride of Rama, from her father, consisted of woollen stuffs, furs, precious stones, fine silken vestments of divers colours, and princely ornaments. Again, in the Mahabharata, in the enumeration of the presents which the feudatory princes brought to Yudhishtira, as their Lord Paramount, mention is made of furs from the Hindu Kush, of woollen shawls from Gujurat, and of clothes of the wool of sheep and goats, and of thread spun by worms, and of plant fibre woven by the tribes of the North-western Himalayas.

The evidence contained in the statements of these two epoch poems is by no means conclusive. Firstly, the Ramayana does not indicate where the particular articles

¹ The synonym "urna" (generally translated "silk") occurs in the Rig Veda, but it is not yet established whether this word denotes the mulberry silk of commerce.

² "Laws of Manu," book V., § 120; book XI., § 168; book XII. § 64.

presented to Sita, were made. The silken vestments mentioned in the list of presents might have been imported from some other country. Secondly, although the statement contained in the Mahabharata clearly points to the presence of a certain kind of worm in the North-western Himalayas, from which thread could be spun, there is no evidence of the silkworm being indigenous in the country of production of that thread.

In view of the fact that the historical evidence does not lead to a definite conclusion, we might now consider the validity of the philological evidence. The word "Kâuceya," signifying "silk" or "cocoon," has been frequently used in the ancient Sanskrit literature. Another word, "Pundarika,"¹ has been translated into "silkworm" by various authors, and the Hindu caste of silkworm rearers has been known as Pundarikakshas or Pundas. None of these words can be traced philologically to the derivative of the words used for silk in the other languages. Almost all the European names for silk are derived from the Latin word "sericum."² The Greek word "Ser" (Σήρ) also closely resembles "soie" in French and "seiden" in German. This apparent likeness points to the common source of the words used for silk in the European languages. On the other hand, the use of an independent word for silk and cocoon in the ancient Sanskrit literature indicates that India possessed a kind of silkworm in very ancient times. By connecting this philological evidence with the reference to silk thread in the Mahabharata we come to the conclusion that a silk-producing industry existed in India long before the Christian era. And, as there is no evidence available of the introduction of the silkworm into India from any other foreign country, it may be supposed that the early Hindus discovered it in the sub-Himalayan

¹ See "Sanskrit-English Dictionary," by Sir Monier Williams, p. 632. (New edition.) The word "Pundraka" or "Pundarika" has been translated as "a man who lives by breeding silkworms."

² Perhaps the Mongol word "Sirkeh" has the closest resemblance with the Latin word "*sericum*." The Chinese words for cocoon and silkworm are "tsau" and "tsi" respectively. The words used for silk in the other languages are as follows:—Corean, Sir; Anglo-Saxon, Seolc; Russian, Sheolk; Icelandic, Silke; and Burmese, Tsa.

regions, independently of the Chinese, who discovered it in their own country.

As previously indicated, some scholars have attempted to throw light on the early export trade in silk by referring to numismatic evidence. This line of investigation does not explain the origin of the silkworm, but is undoubtedly interesting from the standpoint of ancient commerce. It would not be out of place, therefore, to examine the arguments put forth by one of the prominent investigators to show the nature of the international trade just before the Christian era.

The principal argument is based on the exchange of gold coins during the reign of Kanishka, the Indian king who ruled over the territories of Kashmir in about 58 B.C.¹ and presided over the famous Buddhist Conference. A large quantity of gold coins was struck in his reign. The singularity of this coinage is equalled by its diffusion; it is found not only throughout Northern India and the Gangetic Valley; but solitary specimens have been found buried in the ground in Scandinavia and Wales. Another peculiarity of this coinage was the presence of Greek letters on it, as the foreign traders, for intercourse with whom this gold currency was invented, used Greek as a *lingua franca*. It is clear that these coins were minted mainly for the Roman market.

The author of the above research holds that these coins were evidently struck for purposes of foreign trade, which was mainly in raw silk and fabrics in the reign of Kanishka. And as the trade of Kashmir with China was very small during the first century B.C., it might be assumed that the bulk of the raw silk exported to Rome came from Kashmir. At this point it may be suggested that the fact that gold coins were minted mainly for foreign trade does not indicate the extent of the export trade in raw silk from Kashmir. On the other hand, it points to a balance of general imports to Kashmir. And, as there is no further evidence to indicate the extent and the nature of

¹ The above subject was treated by Mr. James Kennedy in an article entitled the "Secret of Kanishka," in the *Journal of the Royal Asiatic Society*, 1912, p. 983.

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imports into Kashmir, the conclusions drawn from the diffusion of gold coins of Kanishka's reign cannot be used in determining the extent of the export trade in silk from Kashmir.

Leaving the present digression aside and resuming the previous thread of our inquiry into the location of Serica, we might usefully refer to the view presented by M. Gosselin who adopted an ingenious system, which led to incontestable results regarding the ancient geography of Central Asia.¹ He endeavoured to show that the true Serica of the ancient Greeks, that is, the original country of silk production, was somewhere near Tibet, or the declivity of mountains that surround it, and was possibly identical with Srinagar, the present capital of Kashmir. He further points out that the ancient Romans were not acquainted with China, that the Chinese people never traded, negotiated, nor were even known to the Romans. If this view were accepted as accurate, then there would be no doubt that the bulk of the raw silk and silken goods exported from Northern India before the Christian era was produced in Kashmir.

It may be safely conjectured from the evidence summed up in the last few pages that silk was produced in India before the Christian era. Among the later authors, who wrote in the second or third century A.D., it is possible to find many references to the Indian silkworm. In the remarks of Servius on a passage from "Virgil" we find the following lines: "Among the Indians and the Seres there are on the trees certain worms, called Bombyces, which draw out very fine threads after the manner of spider; and these threads constitute silk."² Again, Basil also refers to the "horned worm of India," which having first changed into a caterpillar, finally becomes a cocoon and gives a thread which is exported by the Seres for the manufacture of fine garments.³

¹ See "Mémoires de l'Institut de France," tome Quizieme, MDCCCXLII., pp. 30, 31.

² Quoted from "Texrinum Antiquorum," by James Yates (1843 edition), p. 205.

³ Basil, Cl. A.D. 370, "Hexahemeron," p. 79, A. Ed. Benedict.

Another interesting passage quoted by Salmasius (in "Tertullianum de Pallio") from an uncertain author, runs as follows: "The pleasure of the present life is like the Indian worm, which having involved itself in the leaf of the tree and having been satisfied with food, chokes itself in the cocoon of its own thread."¹

The references quoted above clearly show that during the first few centuries of the Christian era, the silkworm was referred to as the Indian worm, which indicates the presence of a silk-producing industry in India during that period. If the Christian authors of the fourth and the following centuries derived their knowledge of the silkworm from the Indian worm, it is probable that India was the principal source from which the migration of the silkworm commenced during the early centuries of the Christian era.

Further, it is interesting to note that the Arabs were also familiar with the silkworm, and even before the pre-Islamic days had studied the life history of this little animal. Ad-Damiri, an Arab zoologist, who wrote in the second half of the fourteenth century A.D., quotes a large number of religious sayings of the early Arabs with regard to the silkworm. It appears from this author's writings that the Arabs observed certain superstitions in connection with the rearing of the silkworm and the use of raw silk, and they also called it the Indian worm. Ad-Damiri writes: "As to the silkworm, it is called the Indian worm and is one of the most wonderful creatures."² As the author's knowledge was based on the early legends and sayings of the Arabs, and as some centuries must have elapsed before an historical importance was attached to the silkworm, it might be legitimately supposed that the Arabs obtained the silkworm from India during the early years of the Christian era.

¹ "Tertullianum de Pallio," p. 242, also given in "Textrinum Antiquorum," p. 231.

² Ad-Damiri's "Hayat-al-Hayawan" (a zoological lexicon), translated from the Arabic by Lt.-Col. A. S. G. Jayakar (Vol. I., p. 794). Ad-Damiri, the author of this useful book, was born at Cairo in A.D. 1341, and died in 1405. He collected the material for his book from an immense mass of Arabic literature, proverbs and pre-Islamic poetry. It is stated that many proverbs were current among the Arabs in relation to the silkworm.

So far we have traced the development and the extension of the silk industry in the eastern countries and have reached that period of the history of silk culture (about the fourth century A.D.) in which the art of producing silk was no longer confined to China, but was well known in India and in Central Asia. There was a regular export trade in raw silk and silken goods from the eastern countries to Persia, and through Persia to Rome. The Persians held a monopoly of some of the manufactured goods,¹ which were highly prized by men and women in all classes of Roman society, and the importations of which resulted in a heavy drain on the gold of the country during the fourth and the fifth centuries A.D., chiefly owing to the high prices demanded by the Persian merchants. In the beginning of the sixth century A.D., the Emperor Justinian imposed heavy duties on silk in order to check the inflow of raw silk and silk goods into the Roman Empire from Persia. But the situation changed for the better in the middle of this century, when two monks, after having resided in Northern India² for some time, learnt the art of raising silk and finally introduced it into Constantinople.³ This event took place in about 553 A.D. and marked the beginning of silk production in Europe.

THE INTRODUCTION OF THE SILK INDUSTRY IN EUROPE

After the introduction of the silkworm into Constantinople the Romans were able to obtain raw silk in their own country, and by gradual efforts they succeeded in developing their resources of silk. For three or four centuries the culture of the silkworm in Europe was confined to the eastern parts of

¹ During the third, fourth and the fifth centuries A.D. there was an extensive silk-weaving industry in Persia and Phœnicia.

² A very interesting account of the first introduction of the silkworm into Europe is given by Procopius in "*De Bello Gothico*," IV., 17. The country in which the two monks resided is named Serinda, "one of the countries inhabited by the various Indian nations." Some authors believe that this "country" was situated in Little Bucharia, but, I think, the text clearly shows that Serinda was somewhere in Northern India.

³ Constantinople was known as Byzantium during the first few centuries of the Christian era.

the Roman Empire,¹ and several manufactories were established at Athens, Corinth, Thebes and the Ægean Islands, for rearing the worm on mulberry leaves, for reeling the cocoons, for twisting the filaments into threads of various degrees of strength, and for manufacturing silk goods.² The silk industry gradually drifted from Greece to the Venetian Republic about the end of the ninth century A.D. It is believed that during the tenth and the eleventh centuries the enterprising Venetians accumulated enormous wealth by their prosperous trade in silk. The western countries of Europe were the principal buyers of the commodities exported from the Venetian Republic.

Among the chief silk-producing and silk-manufacturing nations of Europe in the tenth century, it is necessary to mention Spain. It is not definitely known who introduced the silkworm into this country, but it is certain that after the Arab invasion the silk industry began to flourish. The writers of the tenth century state that during the reign of Abdur-Rahman III. (912 A.D. to 961 A.D.) raw silk and silk goods constituted the principal exports of Spain.³ Tapestries and ornamented silks were sent to the Mediterranean ports.

The introduction of the silk industry into Italy is a matter of considerable historical importance. About the year 1130, Roger II., King of Sicily, and son of the famous Count Roger, the Norman, violently carried away silk weavers from the Holy Land and established manufacturing houses in his capital city of Palermo. The whole culture, manufacture and trade of silk sprang from this central source, and Italy not only reaped a rich harvest from this industrial and commercial development, but also became ultimately famous for her beautiful silks.

¹ The Empire has been called by many names : Greek, Byzantine, etc., but the only strictly correct name is Roman. There were two main divisions, the western and the eastern. Constantinople was the capital of the Roman Empire from 330 A.D. to 1453 A.D. See "Encyclopædia Britannica," 11th edition.

² For full information about this period the reader may refer to "Recherches sur le commerce, l'usage, et la fabrication des étoffes de Soie," by Francisque Michel, published in Paris in 1852. British Museum Library.

³ Cp. M. Giraud's book, previously referred to, p. 57.

In France the silkworm was first introduced in 1340 by several French nobles, who, after their residence in Naples, brought back the silkworms' eggs and the mulberry from Dauphiny. In 1521, artisans were invited from Milan to aid in the establishment of manufacturing houses on a wider basis. All those trees that now adorn and enrich the southern provinces have been obtained from the nursery-grounds of Monsieur Traucat of Nismes, the first-formed in France for the culture of the white mulberry. Later Henri IV. extended every species of protection and encouragement to the plantation of the mulberry, and towards the end of the seventeenth century the silk industry was firmly established in France.

The naturalisation of the silkworm in England has never succeeded from a commercial point of view, owing to the unfavourable climatic conditions. The manufacture of silk goods was introduced during the reign of Henry VI., but owing to lack of serious impulse, the industry remained undeveloped for over a century. The actual progress in silk manufacturing commenced under King James I., and in the year 1629 under the seal of Charles I., the silk-throwsters were incorporated by a royal charter. The principal centre of the industry was in Spitalfields, and, at first, the improvement in the art and design of silk weaving was slow. But in the year 1685, when the persecution of the French Protestants obliged a large number of able and industrious artisans to take refuge in England, rapid changes took place in the organisation of the silk industry. Several commercial controversies arose between England and France in the reigns of Charles II. and James II., mainly owing to the increased exportations of silks from the latter country. In the year 1688, a warrant for a patent was made out for the manufacture of "lustrings" (glossy silks) in England, in response to an application by Pierre de Cloux, a Frenchman. In 1692, the charter was sealed, and those interested in it were incorporated as The Royal Lustring Company of England.¹

¹ A good deal of very interesting information about the formation of The Royal Lustring Company is given by Professor W. R. Scott, in his "Joint-Stock Companies," Vol. III., pp. 73—89. The position

This company enjoyed great prosperity for a number of years and later, several developments took place in other directions. The silk trade in England, after its firm establishment, developed considerably in the following centuries and extended from Spitalfields to the Midland counties¹; but the production of raw silk still remained a foreign industry.

In the other countries of Europe, such as Austria-Hungary and the Balkan States, the silk industry is of a much later growth, and is therefore unattended by any real historical interest.

THE SILK INDUSTRY IN PERSIA IN THE MIDDLE AGES

Another interesting phase of the silk industry is its early and mediæval development in Persia, where Indian and Kashmir commodities were stocked for re-exportation to Constantinople and Europe. Extensive commercial relations existed between Kashmir and Persia in the middle of the tenth century A.D. The most important characteristic of this trade alliance was, that Persia formed a connecting link with India and Kashmir on one side and Europe on the other. The principal towns of the Persian Empire, Baghdad, Jerusalem, Trebizond and Damascus were important commercial centres and produced large quantities of raw silk and silk goods.

In 920 A.D. Ibn Schumah arrived at Baghdad as an ambassador from Constantinople, and was received with great pomp and show at the magnificent court of Moctader Billah, the eighteenth Caliph. He witnessed some wonderful pieces of art in the imperial palace. He writes that the palace was decorated with about thirty thousand curtains, out of which more than twelve thousand were made of silk and brocaded with gold. From other accounts also it appears that by the beginning of the tenth century the silk-

of the English silk industry during the period 1688-1700 is also discussed in that book.

¹ The present position and distribution of the silk industry in England is fully dealt with in a later section of this book.

weaving industry in Persia had achieved a high pitch of success.

The original manuscripts of some of the Moslem geographers abound in primary evidence relating to the production and manufacture of silks in Persia during the tenth, eleventh, and the twelfth centuries. Muḩaddasî mentions raw silk as one of the principal commodities exported from Ahwaz, in the province of Khûzistân in the tenth century. Ḩazvînî and others speak of the heavy silk stuffs that were woven in Yazd. Fars, a province in Persia was renowned for its silks in the eleventh century, and in Mazandarân, sericulture flourished with very good results and silk was plentifully exported from this province.¹

It would be interesting to mention here that Baghdad was the central silk market in Persia in the eleventh and twelfth centuries. The city was divided into several quarters; each carrying on business in a particular commodity. One of the principal quarters was known as the Attabiya quarter, which was famous for the manufacture of "Attabi" stuffs, woven of mixed silks and cotton in many colours. The raw silk was brought from the provinces to the city and was sent to the weaving centre, the Attabiya quarter through a thoroughfare known as Dar-al-Ḩaz.² It appears from the description given by Ibn Jubayr in 1184 A.D., that the Attabiya quarter was one of the most flourishing parts of Baghdad in his day, and was situated in the neighbourhood of the market where the raw silk was received. Probably the silk industry was divided into several parts, and the functions of the raw silk merchants were distinctly different from those of the manufacturers and of the exporters of silk goods.

In addition to the authors referred to in the last few

¹ The accounts of the Moslem geographers, Muḩaddasî, Ḩazvînî, Ibn Hawḩal and Yâkubî, are available, chiefly in the form of manuscripts; some of them lying at the British Museum Library. These have been arranged and translated by G. Le Strange, and a good deal of information about silk is contained in his book "The Lands of the Eastern Caliphate," which contains direct references to these authors and their manuscripts. See pp. 137, 243, 246, 369 and 401.

² The literal meaning of this expression is the Silk House or the Silk Gate.

paragraphs, there are several other Persian writers who casually testify to the flourishing condition of the silk industry in Persia, in the Middle Ages. It is needless to quote them here. We shall now proceed to examine the condition of the silk industry in Kashmir, and in other parts of India in the fourteenth century and in the centuries following.

THE SILK INDUSTRY IN KASHMIR AND INDIA

History is absolutely silent with regard to the actual condition of the silk industry in Kashmir in the fourteenth and fifteenth centuries. For centuries, perhaps, progress in silk culture was stifled by the incessant political changes in the country. After the decline of the Hindu ascendancy, the new rulers failed to realise the benefit of fostering a profitable industry. It is believed that by the time of the Moghul conquest sericulture had declined to a great extent. The Moghals tried to bring about a revival, but it is not known how far their earlier efforts succeeded.

There are occasional hints as to the presence of the mulberry and the silkworm in the writings of the mediæval historians. Mirza Haider in his "*Tarikh-i-Rashidi*,"¹ refers to the large number of mulberry trees (cultivated for feeding the silkworms) among the wonders of Kashmir. Similar references are also found in the "*Ain-i-Akbari*"² (Administration Report and Statistical Return of Akbar's government). The author states that the mulberry was little eaten in Kashmir, its leaves were reserved for the silkworm. The silkworms' eggs were brought from Gilgit and Little Tibet, in the former of which they were produced in greater abundance.

The period indicated by Mirza Haider is the first half of the sixteenth century, and the author of the "*Ain-i-Akbari*" refers to the condition of the Kashmir silk industry during the last decade of the same century. It is difficult to fill the

¹ "*History of the Moghals of Central Asia*," written about 1536 A.D., original in Persian.

² Abul-Fazal's "*Ain-i-Akbari*," period about 1590 A.D., in Persian, p. 562.

gap between these two periods owing to the absence of reliable information, but it may be assumed that during the sixteenth century Kashmir possessed a silk-producing industry, since the weaving industry derived its raw silk from within the country. The famous Kashmir shawls and woven silks were exceedingly popular in Akbar's court, where frequent exhibitions were given of the artistic productions of the weavers of the Moghal Empire. Yusuf Khan,¹ the feudatory chief of Kashmir, under Akbar, realised the importance of these exhibitions and, under the imperial injunction, passed regulations by which the rearers and the spinners were brought together. By these measures the silk industry in Kashmir was given a fresh impetus, and it continued to flourish for a few years.

In Jahangir's reign (1605-1628) the silk-producing industry in Kashmir was probably in the same condition as it was in Akbar's reign. The author of the "Tuzak-i-Jahangiri"² ("Memoirs of Jahangir") states that Kashmir had an abundance of mulberry trees, and the people reared silkworms whose eggs were brought from Gilgit and Tibet. This reference indicates that the sericultural industry was practised in Kashmir to some extent, in the beginning of the seventeenth century. Apart from these references, no other information is available of the actual extent of the production of raw silk, or of the economic condition of the silk producing industry.³ The absence of historical infor-

¹ *Vide* "Ain-i-Akbari," chapter on Kings of Kashmir under Akbar.

² "Tuzak-i-Jahangiri," Persian edition; compare also Roger's Translation, Vol. II., p. 146.

³ The following is a list of the Persian manuscripts consulted for the period sixteenth, seventeenth and eighteenth centuries. Hints as to the presence of the mulberry and the silkworm in Kashmir are given in all of them: (1) I. O. Library MS. No. 479, entitled "Nuskah dar Fan-i-Falahat," or "The Art of Agriculture," by Nasar Jang, written about 1729 A.D. (2) "Tarikh-i-Kashmir" ("History of Kashmir"), by Narayan Kaul, written in 1726 A.D., I. O. MS. No. 510; Bodleian cat. No. 318; and Brit. Mues. Rien. I., p. 298. (3) I. O. MS. No. 2,409, entitled "Haft-aqlim" or "The Seven Kingdoms." (4) I. O. MS. No. 513, "Waqiat-i-Kashmir" ("A History of Kashmir from the Earliest Times down to 1747 A.D."), by Mohamed 'Azam. Bodleian Cat., No. 319. Brit. Mues. Rien., p. 300. The other MSS. consulted have been mentioned in the text.

mation may be attributed to the lack of interest in silk on the part of the historians of the sixteenth and seventeenth centuries. But whatever the reason may be, it is obvious that the history of the silk industry in Kashmir remains obscure during that period.

It is surprising to note that, while the history of the Kashmir silk industry and trade is practically unknown from the fourteenth to the eighteenth century, considerable information of historic importance is available regarding the development of the silk industry and trade in India. This is due chiefly to the commercial activities of the Mohammedan Moors, who transmitted during the fourteenth and the fifteenth centuries, the rich merchandise of India for the European markets, and left a few records of their trade and commerce. The merchandise (which included silk) was exported India to Aden in Arabia, and by the Red Sea to Suez, whence it was conveyed upon camels to the Nile, and there shipped for Grand Cairo and Alexandria. Sometimes it was carried from the Persian Gulf to the Euphrates and afterwards conveyed by caravans to Aleppo. From these places it was dispersed by the Venetian and other European merchants over the western world.¹ It is difficult to ascertain how much of this trade included silk, but it is certain that silk was regarded as one of the important commodities exported from India during the two centuries under review.

Later information is available from the accounts of Ludovico di Varthema,² a traveller who visited various countries in the East, in the beginning of the sixteenth century (1503). Among the commodities imported into Mecca, mention is made of "a very large quantity of stuffs of cotton and of silk from a city called Bangchella in India Major." In another part of his account, while describing the city of Combeia, known at present as Cambay, the traveller mentions silk stuffs among the exports from this

¹ England was supplied with Indian commodities by an annual ship from Venice "of great burthen and immense value, which they sold at their own prices."—Milburn, "Oriental Commerce," Intro. i.

² "Travels of Ludovico di Varthema," *Journal of the Hakluyt Society*, Vol. XXXII., pp. 38, 107.

city to all parts of India, and other countries. It appears from the accounts of Varthema that, in the first place, the Mohammedan Moors and the Arabs were the chief oriental merchants and navigators ; and secondly, silk was exported to Mecca and other places from India.¹ Another conclusion which might be drawn from the reference to Bangchella is, that the silk exported from India was produced in Bengal, as it is the only variety mentioned in these accounts.

The beginning of the seventeenth century saw the commencement of the English commercial enterprise in India. Surat was the first centre whence commodities from all parts of India and the Far East were exported to England. Bengal was the storehouse of Indian silk, and a fairly large silk industry existed, both in rearing the worms, reeling and throwing the silk, and in weaving all manner of silken goods. The First Letter Book of the East India Company gives us some interesting details, and shows that there was a favourable demand for Indian silks in England, and that the merchants of the London Board issued instructions to their agents in India to invest large capital in the purchase of raw silk.

In the middle of the seventeenth century the Bengal silk industry seems to have enjoyed great prosperity. The condition of the industry may be judged from the following interesting account of the export trade of Bengal given by Bernier,² a French traveller, about the year 1658: "In regard to valuable commodities of a nature to attract foreign merchants, I am acquainted with no country where so great a variety is found. Besides the sugar I have spoken of, and which may be placed in the list of valuable commodities, there is in Bengal such a quantity of cotton and silks that the Kingdom may be called the common storehouse for those two kinds of merchandise, not of Hindustan or the

¹ The Indian commodities were probably exported from Calicut, which was the principal exporting mart during the whole of the fifteenth century. It was a perfectly secure harbour and brought together merchants from every city and from every trading country. The Portuguese seem to have established themselves there in the beginning of their trade relations with India.

² "Bernier's Travels," translation published by Messrs. Constable & Co., Vol. I., p. 439.

Empire of the Great Moghal only, but of all the neighbouring kingdoms, and even of Europe. I have been sometimes amazed at the vast quantity of cotton cloths of every sort, fine and coarse, white and coloured, which the Hollanders alone export to different places, especially to Japan and Europe. The English, the Portuguese, and the native merchants deal also in these articles to a considerable extent. The same may be said of the silks and silk stuffs of all sorts. It is not possible to conceive the quantity drawn every year from Bengal for the supply of the whole of the Moghal Empire, as far as Lahore and Kabul, and generally, of all those foreign nations to which the cotton cloths are sent. The silks are not certainly so fine as those of Persia, Syria, Sayd and Barut,¹ but they are of a much lower price, and I know from indisputable authority that if they were well selected and wrought with care, they might be manufactured into most beautiful stuffs. The Dutch have sometimes seven or eight hundred Indians employed in their silk factory at Kasim Bazar, where, in like manner the English and other merchants employ a proportionate number."

The extract from Bernier's account, quoted above, clearly shows the importance of silk production in Bengal in the middle of the seventeenth century, not only to India, but to Europe as well. It must be noticed that almost all the foreign merchants trading in India at that time took part in the silk trade. The reeling and the weaving branches of the silk industry were organised chiefly by the Dutch and the English for purposes of exportation. The labour employed in the silk factories was entirely Indian, though the control and the management was in the hands of the foreigners. It is, however, familiar to us from the records of the East India Company, that the company's agents were, at this time, beginning to concentrate their efforts on a complete acquisition of the silk industry in Bengal.

Another tourist, Jean Baptiste Tavernier,² gives a full

¹ Barut or Beyrout.

² Jean Baptiste Tavernier's "Travels in India," translated by Ball, Vol. II., pp. 2—3, Chapter entitled "Concerning Silks."

report of the exports of silk from Bengal in 1676. According to this writer, Kazim Bazar, a village in the kingdom of Bengal, furnished about 22,000 bales of silk annually, each bale weighing 100 livres. This huge quantity was exported either to Japan or to Holland. Sometimes the merchants of Tartary and of the Moghal Empire received a large share of Bengal silk ; they wove the raw silk into fabrics and sent them to Kabul and the neighbouring countries. The silk was yellow, but the people knew how to whiten it with a dye made of the ashes of a tree which was called " Adam's fig," and which made it as white as the silk of Palestine. The internal trade, the writer adds, was carried on by means of small boats through the canal, and thence to the Ganges. After descending the Ganges, the boats reached Hugly where the goods were shipped for export.

According to Tavernier's account the silk industry and trade in Bengal was in a very flourishing condition during the last but one decade of the seventeenth century. Obviously this prosperity continued for over half a century after the tourist's visit to India, as the records of the East India Company abound in frequent references to the methods employed in the development of the silk industry in Bengal. The one particular feature which must be recorded here is that, while in the beginning the Dutch played the most prominent part in the organisation of the export trade in silk from India, by the end of the seventeenth century the East India Company had acquired a full control of silk production in Bengal. The British competition with the Dutch and with other European nations in the manufacture of silk goods, considerably raised the demand for raw silk in England. This increased demand was supplied by the East India Company, whose agents did their best to enhance their prestige by increasing the production of raw silk in Bengal.

After the acquisition of a monopoly, both of production and of trade, by the Company, the silk industry in Bengal continued following an upward movement till the middle of the eighteenth century, after which the period of decline commenced. The servants of the Company in India, in their

greed for money, threw aside all sense of responsibility and, by their dishonest practices, created an untenable situation. The directors of the Company constantly issued instructions prohibiting their servants from exercising undue rights, but owing to certain reasons they failed to eliminate corruption from the then existing system of the export trade. The net result of this disorganisation was that the end of the eighteenth century saw the gradual downfall of the silk industry and trade in Bengal. The company, however, continued their interest in Bengal silk till the year 1835, after which the silk industry was left to its own fate, and no further efforts were made by the directors to cause improvement in the methods of production or in the manner of exportation.

Since the middle of the last century, the product of the Bengal silk industry has played a comparatively unimportant part in the world's market, and the industry itself has remained more or less obscure owing to various reasons. In a later chapter we shall refer briefly to the present condition of the silk industry in Bengal.

In the present chapter, we have discussed a variety of problems, each of which was connected, in some form or other, with the history of the silk industry in different countries of the world. It may be admitted that this part of the subject presents a scattered view of the introduction and development of the silk industry in different countries, owing partly to lack of complete historical data and partly to the vast extent of the subject. At this stage, therefore, it is advisable to summarise the main points of the present inquiry.

First of all, we commenced our investigations from the supposed initial source of silk production in China and followed the movement of silk culture to Central Asia and Kashmir. But owing to the presence of favourable philological and partly historical evidence, we conjectured that the silk industry might have acquired an independent growth in Kashmir and India. The accounts of the Greeks and the Romans furnished us with historical information relating to the export trade in raw silk and silk goods from India to

the western countries, just before the Christian era. Later, in the beginning of the Christian era, we saw the Persians acquiring a monopoly of the silk trade and making the Romans pay heavily for their supplies of silk. This monopoly remained in force till the middle of the sixth century A.D., when the eggs of the silkworm and seeds of the mulberry were brought to Constantinople from Northern India by two monks.

The second phase of our discussion was the introduction and the development of the silk industry in different countries of Europe, and its gradual movement from the eastern parts of the Roman Empire to the Venetial Republic, Italy, France and Spain, and finally, the introduction of the silk manufacturing industry into England.

The third aspect of the historical part of the subject dealt with the condition of the silk industry in Persia, in the Middle Ages, and the importance of Baghdad as the central silk mart of the Persian Empire.

Finally, we touched upon the condition of the silk industry in Kashmir from the fourteenth to the seventeenth and eighteenth centuries, and also examined the position of the silk industry in Bengal during the same period. The end of the eighteenth and the beginning of the nineteenth century saw the gradual decline of silk production in Bengal. But, happily, the silk industry in Kashmir was re-organised on a commercial basis before the last decade of the nineteenth century, so that the loss incurred by the Indian silk industry in Bengal was more than regained by the development of sericulture in Kashmir. At the present time, Kashmir forms an important source of raw silk and is likely to play an important part in the European silk markets. The recent history of the Kashmir silk industry attracts our attention, not only owing to its quick transition from obscurity to light, but also owing to its economic importance to the textile industries of the British Empire.

Before proceeding to the present geographical distribution of the silk-producing industry in the world and before indicating the relative importance of the present sources of raw silk, we shall give an account of the recent history of the

Kashmir silk industry in the next chapter. The recent development of silk culture in Japan is also full of economic interest, but from our point of view it is best to concentrate our attention only on the growth of the industry in Kashmir, so as to indicate the different stages of transition. In some of the later chapters we shall occasionally refer to the methods employed in other silk-producing countries, such as Italy and France.

CHAPTER II

RECENT HISTORY OF THE KASHMIR SILK INDUSTRY

IN the previous chapter it was stated that the silk industry in Kashmir remained in complete obscurity during the seventeenth and eighteenth centuries owing to want of historical information. Perhaps a certain amount of silk was produced in Kashmir during that period, but as no particular importance was attached to its production by any writer, the extent to which the industry was practised remained unknown. It is, however, interesting to note that, since the middle of the nineteenth century, the different stages in the growth of the sericultural industry in Kashmir have been recorded by casual writers, as well as by the State officials.

One of these writers, an Indian¹ tourist who visited the valley in 1846, gives a brief account of the production of silk. From his account it appears that the silk-producing industry was practised by scattered villagers who lived in remote corners of the valley and did not form a combination. The production of raw silk was limited to certain areas where the rearers worked up the indigenous silkworm and wove the raw silk into cloth privately in their own cottages. The lack of organisation in the industry was due partly to the absence of commercial enterprise and partly to the difficulties of transport. But in spite of all these drawbacks the State derived a revenue of about £2,000 a year from silk culture. The writer adds that if there were proper organisation the State could obtain a revenue of about £10,000 a year from the silk industry alone.

¹ See "Tuhfa-i-Kashmir" ("Wonders of Kashmir"), by Munshi Ganeshi Lal, pp. 55, 56. This book was published in 1846. The figures for revenue given in the original edition are Rs. 22,000 and Rs. 1,00,000, and are equivalent to about £2,000 and about £10,000 on the basis of the rupee coin current at that time.

The next episode which brought the Kashmir silk industry to light is strangely connected with the European epidemic of 1855, when a serious silkworm disease broke out on the Continent. It was thought that this epidemic, which had already spread all over Europe, would prove fatal to the silk industry, and in order to avoid a disastrous industrial depression among the silk-producing communities, the European Governments sent expeditions to different parts of the world to obtain the silkworms' eggs. Consequently two Italian "graineurs" ¹ set out for Calcutta in 1860, and then proceeded to Kashmir. They secured a large quantity of the seed (eggs) from that country and came back to Italy after having achieved their object.—The following account of their visit given by M. Kleber, ² will be interesting :—

" CACHEMIRE "

" En avril 1860, MM. Orio et Consonno, graineurs italiens, s'embarquent pour l'Inde. Ils arrivent en mai à Calcutta, où, aidés des bons offices du gouvernement anglais, ils peuvent se diriger vers le royaume de Cachemire et procéder à un grainage assez important, 25,000 onces. Ces semences sont emballées dans des caisses entourées d'une épaisse couche de laine et aérées seulement la nuit ; elles arrivent en très-bon état en Italie, fin novembre.

" Soumises à l'examen microscopique de MM. Vittadini et Cornalia, ces observateurs les déclarent saines en tous points.

" Le Cachemire doit être, pour la température, assimilé aux régions froides de l'Italie ; l'incubation s'y fait seulement dans les premiers jours de mai.

" La feuille est fournie entière au ver dès le premier âge, non détachée des rameaux, une fois par jour seulement jusques au troisième, et l'éducation se continue ainsi à la méthode turque, mais avec une alimentation mesquine. Elle dure quarante jours, et le ver file son cocon sur l'édifice d'un mètre de haut, constitué par les rameaux entassés.

¹ "Graineurs" means producers of the silkworms' eggs, for purposes of reproduction. It is a separate branch of sericulture and will be discussed later.

² See " Monographie du Cocon de Soie," by M. Duseigneur Kleber, p. 166.

“Le cocon Cachemire a la plus grande analogie de forme et de grosseur avec les races d’Albanie et Monténégro, mais il est loin d’avoir leur solidité de coque.

“Il a fallu au fileur généralement 16 à 18 Kil de cocon pour un de soie.

“L’on a dit, à l’époque, que le maharadj s’opposait à une nouvelle expédition de graineurs dans ses États. Je crois que l’obstacle vrai est dans l’insuccès de la première.”

From this illuminating account we may safely conclude that sericulture was practised on a considerable scale in Kashmir in the middle of the nineteenth century. A country from which two unknown foreigners could secure 25,000 ounces of seed must have possessed a good deal more in stock for her local use. The industry could have been more prosperous but for the lack of economic organisation. The account of the Indian tourist draws our attention to the scattering of the industry, while that of the Italian “graineurs” points to the silk-producing capacity of Kashmir, and if these two accounts are put together, it becomes evident that after the middle of the nineteenth century there were great prospects of extending the production of silk in Kashmir on a commercial basis. It must be remembered that foreign competition demanded the organisation of the silk industry on scientific and economic lines, and it was, therefore, impossible to allow this important industry to follow its own course for a very long time.

The unorganised state of the silk industry continued till the year 1869, when Maharaja Ranbir Singh took up the task of revival with the spirit of a modern industrial reformer. His idea, as an organiser of production on a large scale, was to inaugurate the silk industry in its proper place among the other productive concerns of the State. Fully realising the value of unlimited natural resources, he set his new financial scheme into practice by having 127 rearing-houses built in all parts of the valley. The reeling appliances and machinery were imported from Europe, and a Department of Sericulture was formed. Every possible effort was made to increase the standard of efficiency of the rearers, and new guilds were instituted to carry out the directions of the

authorities. The principal object in view was to establish the silk industry on purely business lines, and to extend its export trade as far as local circumstances would allow.

In order to achieve success in this undertaking the officials of the State were asked to take part in the organisation of the industry. The Chief Justice of Kashmir (Mr. N. Mukerji) personally superintended the operations, but the only improvement he was able to effect from 1869 to 1871 was in the quality of the silk reeled, which he did by specially organising a body of reelers and teaching them better methods of reeling than those which had been in practice. There was a distinct improvement in the samples of raw silk, which were forwarded in 1872 through the Government of India to Her Majesty's Secretary of State. The samples consisted of : (1) silk reeled from yellow cocoons by water power ; (2) silk reeled from white cocoons by water power ; and (3) silk reeled after the old fashion.¹ The silk-brokers² in London, to whom the samples were submitted, presented the following report :—

“ There is much in samples (1) and (2) very encouraging ; the nature of the silk is good, showing that the cocoons have a thread which has strength and nerve, and capable of being made into excellent silk. We find the quality of the thread, as also the thread itself, superior to much of the native-reeled silk of Bengal. . . . We would put the value of such silk as that shown by samples (1) and (2) at 23s. and 24s. per lb. ; as for (3) it can scarcely be classed as ‘ raw silk,’ but as waste silk it might fetch about 3s. per lb.”

The above report shows that the reeling methods had been slightly improved and the quality of the raw silk produced was better than that of the Bengal silk, but so far much attention had not been paid to the rearing of the silkworms. In 1872, the Chief Justice undertook to effect improvements in the existing system of rearing of the silkworms. He sums up his efforts thus in a note dated August 19th, 1876 :—

“ From that time (*i.e.* 1872) to this day I have been trying, to teach the people an improved system of rearing the silk-

¹ See “ Memorandum on Silk in India,” by L. Liotard, p. 47.

² Messrs. Durant & Co. were the brokers consulted by the authorities.

worms ; and the unwearied exertions of Dewan Kirpa Ram, the Prime Minister, and Wazir Punnoo, the Governor of Kashmir, under the watchful eyes of His Highness the Maharaja, have enabled me to increase the quantity and improve the quality of the annual out-turn of cocoons and silk.

“ To ensure complete success I distributed in 1875, in accordance with His Highness’s instructions, small quantities of eggs to a number of *zemindars* (landowners), and I circulated in a printed form certain simple instructions for the guidance of the rearers.

“ The most important peculiarities of the system of rearing now followed in Kashmir are the following :—

“ (1) One hundred and twenty-seven Government magnaneries have been built on an improved plan for the use of the rearers, who pay rent for the same, and a number of skilled rearers teach the people, gratis, the importance of space, temperature, light, ventilation, and cleanliness.

“ (2) Eggs in small quantities are being distributed to the *zemindars*, who rear the worms in their own houses and engage their children and women in tending the worms ; and as they have not to attend to a very large number of worms, they produce cocoons much better than those gathered by professional rearers, who hatch large quantities of eggs.

“ (3) The *Kirmkashes* (worm-killers) rent *zemindars’* houses and Government magnaneries.

“ (4) Every rearer receives advances from the Government in proportion to the quantity of cocoons he is expected to produce.

“ (5) The rearers pay nothing to the Government for mulberry leaves, nor have they to pay any tax or duty on the cocoons produced.

“ (6) The rearers kill the *chrysalides* by exposing the fresh cocoons to the heat of the sun, and bring the cocoons when completely desiccated, to the nearest filature, where they are assorted as good, bad, double, and payment is made according to the quality of the cocoons.

“ His Highness has been giving the *zemindars* every encouragement to employ their spare hours to this profitable

occupation, and every year adds to the number of those who are eager to rear worms in their own houses instead of renting them to the Kirmkashes.

"By a careful special training under the superintendence of experienced reelers from Bengal, 964 persons (Hindus and Mahommedans) have been accustomed to the skilful manipulation of the filaments and to the use of reels of the pattern used in the European filatures. Out of this number 125 reelers can turn out silk of the first quality. The reelers receive their pay in cash. The number of reels worked at present is 470, of which 42 are turned by water power.

"To ensure all the advantages enjoyed by the European filatures, a steam boiler with tubings will shortly be fitted up at Raghunathpore, and the water in each basin will be heated by steam from the boiler, and not by a stove, as is done now."

The efforts of the Chief Justice, as summarised in his report, clearly show that the State authorities were very anxious to develop the silk industry on proper lines. It was felt that the supply of the mulberry trees in the State was not sufficient to meet further demands, and consequently arrangements were made for more extensive cultivation of the white mulberry in dry and elevated tablelands of Kashmir.¹ In 1873 cuttings of the China mulberry were obtained and planted out, and were reported in 1876 to be thriving remarkably well, as their leaves were to be used for the worms in the following summer. Under the new scheme prepared by the Chief Justice, the mulberry plantations were completely ready by April, 1877, so that one of the essential factors in production was regarded as complete. But this was not actually the case. It will be shown in a later chapter that even to-day the number of mulberry trees in Kashmir could be greatly increased for the further extension of the silk-producing industry.

Another important problem that confronted the organisers

¹ A very interesting account is given of the production of silk by Dewan Kirpa Ram, the Prime Minister, in his Annual Report on Industries (*Gulzar-i-Kashmir* in Persian) for the year 1870, p. 503. He says "Increase in the revenue from, and prosperity of silk culture depend, on the mulberry trees."

in the year 1873 was the supply of the eggs. It was considered highly desirable to introduce a new breed of the silk-worm into Kashmir, in order to hybridise it with the indigenous race. Having this in view, the authorities obtained a few cards of Japan eggs through the Registrar-General at Hongkong in the year 1874. These eggs were hatched in the summer of the following year and the results were "very satisfactory." The worms spun cocoons which, though smaller in size than those of Kashmir, were very compact in texture and firm at both ends, and had in all of them the usual depression in the middle.

In 1875, thirteen specimens of the best raw silk reeled in Europe were procured through the Government of India for the information and guidance of the Chief Justice, and in 1876, 4 lbs. of cocoons and 1 lb. of silk manufactured at the State factory in Kashmir were sent to London for valuation. The samples were later handed over to the brokers and reelers of silk at Lyons. The reports of the experts on these samples were very favourable, and spoke very highly of the "most creditable production" of silk in Kashmir. Certain improvements in the methods of reeling were suggested by the French reelers for the benefit of the Kashmir reeling factory.

The State authorities in Kashmir, as a result of these favourable reports, were greatly encouraged to undertake further extension of the silk industry. But, unfortunately, a disease had already begun to destroy the worms within the valley, and in acknowledging the reports, the Kashmir Durbar informed the Government of India in November, 1878, that "a bad epidemic" had completely damaged the industry, and that renewed exertions would have to be made to give a fresh start to it.

This sudden downfall of the industry was attributed to the breaking out of the epidemic in the valley. Perhaps this was one of the principal causes of the downfall, but there might be other economic reasons which would perhaps explain the situation better than mere scientific conclusions. We cannot deny the possibility of a disease destroying the whole of the cocoon harvest, but at the same time we cannot exclude

other causes from our analysis of the situation. It is obvious that the centralised system of control exposed the industry to a general calamity when the disease broke out in one of the producing areas. But, then, it might be argued that if the industry was well organised and had plenty of experience and capital behind it the disease could have been stopped before it affected the whole of the silk-producing industry. The net result was that the industry which was re-organised with great enterprise and keenness by the State in 1869, was virtually abandoned in 1879.

It would be difficult to enumerate all the economic causes that led to the sudden downfall of the Kashmir silk industry in 1879, as systematic historical information is not wholly available. But it is quite evident that the task of revival was undertaken on too large a scale to ensure success, especially when the country was not fully ripe for it, both financially and industrially. There is a great danger in setting forth a large financial scheme when capital is scarce in a country. It is by far the wisest plan to start a comparatively small enterprise, and then to develop it gradually.

Parallel instances are found in the industrial history of every country, where owing to want of capital and skill, such enterprises have resulted in a complete failure. In Scotland we find a similar example with almost the same results. "From the Restoration till just before the Union there was a systematic effort to develop a distinctively Scottish commercial policy, which aimed at transforming rather backward industries into highly organised ones. The establishing of manufactures, fisheries, and colonies soon became little less than a national obsession. It was proposed to transform the surviving domestic industries at one bound into industries working on the factory system, as it then existed in special places and under special circumstances, and the result was, to a large extent, a leap in the dark. The chief emphasis was laid on a change in the woollen trade. Instead of producing the coarse cloth known as plaiding or fingsrams, a resolute effort was made to create manufactures in the towns or near towns, of fine broadcloth which would compete with that woven in England. Before the end of the century

upwards of a dozen of these manufactures had been started, in some of which wages were paid to between 750 and 1,000 workers. The hopes, the disappointments and success of the *entrepreneurs* are recorded in their own words in the minutes of a company which was started at Haddington in 1681. In addition to cloth works, factories for making linen, silk, paper, stockings, sailcloth, ropes and cordage were established ; also several sugar manufactories, mining undertakings, and two hardware works. One cannot escape the conclusion that too much was attempted in too short a time. The country had not sufficient capital to finance the new industries, nor was there enough technical skill available." ¹

The Kashmir silk industry was a victim partly to inefficiency and lack of organisation, and partly to the disease referred to in a previous paragraph. Moreover although the capital required to finance the silk industry was supplied by the State, the returns of the first investment could not be realised till after some years, and, therefore, any further investment on a large scale became impossible after the failure of the industry in 1879.

Efforts were, however, made to re-start the rearing industry and to remove the difficulties connected with the reeling of silk, and in 1881 a supply of fresh eggs was obtained from Japan. It is not definitely known how far the industry progressed from 1881 to 1890, as during that period the State left it entirely to the silk rearers.

In the beginning of the year 1890 the State authorities again decided to undertake the production of raw silk in Kashmir, and on the advice of experts adopted the Pasteur system of microscopical examination of the silkworms' eggs.² Good seed was imported from Italy and France, and an excellent crop was obtained. In October samples of raw silk were sent by Colonel Nisbet, the British Resident at Srinagar, to Sir Thomas Wardle of Leek, who carefully examined the samples and in his letter of December 5th to the Resident, strongly urged the adoption of an improvement

¹ The above passage is taken from Professor W. R. Scott's " Report on Home Industries of Highlands and Islands," pp. 7, 8.

² In order to prevent disease, it was decided to examine the eggs under the microscope before their distribution to the rearers.

in cocoon-reeling on European lines, and further observed that there was not the slightest doubt that the production of silk might be the foundation of a large and remunerative industry in Kashmir.¹

Realising the prospects of success the State placed the direction of the silk industry under the charge of Mr. R. Mukerji, a Bengali expert, who conducted the operations successfully from 1890 to the beginning of 1894, and deserved all the credit for having achieved the main object of securing healthy local seed. After the retirement of Mr. Mukerji in the beginning of 1894, Sir Walter Lawrence was placed in charge of the Sericulture Department. His efforts were also directed towards obtaining healthy seed and avoiding unnecessary expense. In order to render good supervision possible and to give encouragement to the rearers, he raised the price paid by the State for cocoons, and to stop the reckless wastage which prevailed formerly, he issued orders for the preservation of the mulberry trees.

The production of raw silk was now properly organised in Kashmir, and its future prospects were quite hopeful. The product of the Kashmir silk industry had now to be advertised, and to do this 8 lbs. of raw silk were sent over to England in 1894 to be manufactured into brocade by Messrs. Warner and Sons, of Braintree. The first fabrics made out of this silk were exhibited at the Stafford House Silk Exhibition of that year by Sir Thomas Wardle. The following is the report of Messrs. Warner and Sons, dated May 12th, 1894 :—

“ We are glad to inform you that the Kashmir silk, which we wove into a small piece of goods at our factory in Spital-fields, seems to us to be the best we have ever seen from India ; it is very strong and very bright when dyed.

“ The sample is coarse in size, which might arise from having too many cocoons used in the reeling ; but, if it could be obtained finer in size its market price would be about equal to that of China silk, and it could then be brought in

¹ See Sir Thomas Wardle's letter to Col. Nisbet, dated December 5th, 1890, in “ Kashmir and its New Silk Industry,” by Wardle, p. 14.

general use. Otherwise it would only be useful in certain fabrics such as tapestry.

"It gives us much pleasure to be able to report so favourably on a product of our Indian Empire."

This favourable report afforded sufficient encouragement to the Kashmir State, and in July, 1895, further samples of raw silk, consisting of sixteen bales of three different qualities were forwarded to the India Office on behalf of the Kashmir Durbar, for sale in the London market. The highest tender offered and accepted was 13s., 11s., and 11s. per lb. for the three qualities respectively.¹ Sir George Birdwood, who personally attended to these transactions for the India Office, makes the following remarks in his memorandum.² "I may add that I was constantly in personal discussion with all sorts of persons interested in this experimental consignment, and that so far as I can judge there seems to me to be a unanimous opinion among English silk brokers, merchants, and silk manufacturers, throwers, dyers, and weavers, of the excellent quality of Kashmir raw mulberry silk, and of the high prices sure to be paid for it if carefully reeled, and imported under its various denominations of uniform quality. No doubt seems to be entertained of its competing successfully with the best Italian denominations of raw mulberry silk."

The remarks of Sir George Birdwood quoted above clearly indicate that, in spite of the favourable opinions expressed by the British silk trade, the Kashmir raw silk was in need of improvements in certain directions, particularly in the reeling. It is obvious that up to the year 1895, the improvements introduced into the methods of silk culture were more or less on an experimental basis, and it was therefore necessary to extend the activities so as to develop a regular export trade. This extension necessarily involved the establishment of filatures, and in 1897, the erection of reeling factories was commenced. By the end of 1903 ten filatures were in full working order. It may be noted here that the building

¹ This tender included all the dock charges.

² See the Agricultural Ledger, No. 10 for 1898. The pamphlet is entitled "Sale of Raw Silk for the Kashmir Durbar," p. 4.

of the first six filatures involved an expenditure of about £28,000 ; each of these filatures was 425 feet long and contained 212 reeling basins, *i.e.*, 1,272 in all.

After the gradual establishment of filatures in 1897, the silk-producing industry in Kashmir made a steady progress. The quantity of the seed imported from France and Italy and distributed among the rearers, living in different parts of the valley, was gradually raised from 1,920 ozs. in 1898 to 35,500 ozs. in 1904, and during the same period the quantity of raw silk produced, increased from 5,412 lbs. to about 90,000 lbs. The success achieved was due chiefly to the good organisation of the cocoon-producing industry, and also to the scientific improvements effected in the methods of rearing the silkworms. Advances were made to the rearers to enable them to build good rearing houses, and the village heads were granted a small commission on the out-turn. The difficulties of management were removed to a great extent by securing the co-operation of the local revenue officials.

The improvements in the reeling industry were effected simultaneously with the extension of the cocoon-producing industry, and by 1906, up-to-date Italian reeling machinery was installed in the new filatures,¹ which gave employment to over 5,000 people in Srinagar. The quality of the silk reeled in these filatures steadily improved and commanded a price slightly below Italian silk in the European market. Economy in the consumption of fuel was obtained by laying steam pipes in the filatures, and to provide, as far as possible, against fire, hydrants were fixed in several places in the factories.

After the year 1906, the improvements introduced into the Kashmir silk industry were mainly of a technical nature. So far as the organisation was concerned, the position of the industry had been made secure by the establishment of various centres for the distribution of the seed free from disease, and any further extension of the industry now depended on the increase in the number of rearers and also

¹ See Jammu and Kashmir Administration Report for the year 1904-05, p. 108.

on the quantity of the seed distributed. The cultivation of the mulberry trees on an extended scale had already been taken up by the mulberry inspector, and rules for the better preservation of the trees had been issued by the sanction of the Durbar. The following table, compiled from the Administration and Sericulture Reports of the State, gives a picture of the gradual development of the silk industry in Kashmir, and indicates occasional fluctuations in the amount of production during a period of ten years from 1906-07 to 1915-16.

TABLE SHOWING (a) THE NUMBER OF REARERS, (b) THE QUANTITY OF THE SEED ISSUED, AND (c) THE PRODUCTION OF RAW SILK, IN KASHMIR FOR 1906-07 to 1915-16 :—

Year.	Number of Rearers Employed.	Seed Issued in Ozs.	Maund- age of Cocoons.	Produce per Oz. of Seed Yield.	Raw Silk Produced.	Waste Silk Pro- duced.
	No.	Ozs.	Mds.	Lbs.	Lbs.	Lbs.
1906-07	14,427	27,544	21,409	63½	115,748	74,989
1907-08	17,433	28,221	28,421	82	132,760	98,179
1908-09	18,949	27,954	23,490	68	129,045	71,461
1909-10	26,234	32,060	36,428	92	184,221	95,902
1910-11	35,034	34,156	40,407	98	168,167	97,606
1911-12	41,552	34,251	37,565	88	215,749	125,244
1912-13	46,363	36,006½	37,487	85	181,056	129,969
1913-14	47,501	36,735½	37,921½	85	94,978	73,850
1914-15	48,936	36,738½	33,672½	74½	53,597	24,727
1915-16	51,076	37,610	33,862	73½	96,879	73,042

It will be seen from the above table that from 1906-07 to 1910-11, there was a gradual increase in the annual out-turn of cocoons as well as in the number of rearers employed, which shows that the cocoon-producing industry was extending rapidly every year. The increase in the production of cocoons per ounce of the seed from 63½ lbs. in 1906-07 to 98 lbs. in 1910-11 indicates that, in the first place, the rearers acquired greater efficiency in rearing during that period, and secondly, the seed issued was gradually improving

in quality. The output of the filatures during the five years under review is marked with fluctuations. There was a rise in the amount of raw silk produced in 1907-08, but this rise was not maintained in 1908-09, chiefly owing to the smaller amount of the seed issued in that year. In 1910-11, although the amount of the seed issued to the rearers was greater than that issued in 1909-10, the quantity of the raw silk produced was much smaller. But, as the cocoon-crop of 1910-11 was greater than that of 1909-10 it might be assumed that a part of the crop was exported. As regards the production of the waste silk, the figures given in the above table do not show satisfactory results. Roughly speaking, the amount of the waste produced in a well-organised filature should not be more than one-third of the actual amount of the raw silk reeled. But in the case of the Kashmir filatures, the amount of the waste was invariably more than one-half of the raw silk reeled. This reflects rather badly on the efficiency of the reeling hands.

The next period of five years, from 1911-12 to 1915-16, also shows a steady increase in the number of rearers, which indicates that the popularity of the cocoon-producing industry was firmly established in Kashmir. It will be observed that in 1911-12, the total output of raw silk amounted to about 216,000 lbs., and after that year the annual output gradually declined. This decline was due partly to the lower yield of cocoons, caused by unfavourable weather conditions, and partly to the sale of a large quantity of cocoons in India and in Europe. But the very low output of 1914-15 was due entirely to the damage caused to the buildings by a fire which broke out in the filatures and cocoon stores in the beginning of 1914.

It is interesting to note that in 1915-16 the output of raw silk was again increased to its former level. In spite of the difficulties arising out of the war, some of the filatures in Kashmir were working by night and day in order to execute orders for different qualities of raw silk. The shortage of European crops caused a marked increase in prices about the middle of 1915, and as silk was required for a multitude of articles which could not be regarded as luxuries, there was

no general falling off in the demand for it. The difficulties in the exportation of silk from China and the stoppage of arrivals to Europe from Syria, owing to Turkey being involved in the conflict, gave the Kashmir silk industry an additional impetus for production. Increased efforts were therefore made in 1915 and 1916 to improve the position of the reeling industry, and to make good the loss incurred in 1914 owing to the breaking out of fire in the filatures.

At this stage a general summary of the recent development of the silk industry in Kashmir may be made, illustrating its industrial importance and economic significance. In spite of the difficulties that the industry had to face in its infancy, there are a number of features that one cannot ignore even at first sight.

In the first place, we notice that there were great difficulties of labour supply at the commencement of the operations. A sudden transition from one occupation to another was not very pleasant to the agriculturist who was accustomed to the cultivation of rice from times immemorial. The problem was very complicated at the outset, as in Kashmir quite a number of other cottage industries flourished besides the field work, and the rearing of the silkworms was a kind of abnormal deviation for some people. The official pressure became quite intolerable in the beginning, but gradually the cultivators realised the importance of silk culture to themselves, and the supply of labour became abundant. The increase in the number of rearers from 14,427 in 1906-07 to 51,076 in 1915-16, shown in the last table, points to the fact that silk culture has become very popular in the valley.

The next important feature worth observing is the way in which the Kashmir artisan has adapted himself to the modern methods of production. His delicacy of touch and hereditary skill soon helped him in acquiring a thorough knowledge of the use of the reeling machinery, and by thus increasing his working capacity, he was able to increase the annual output of raw silk.

The third interesting feature is the development in the organisation of the industry. The State took proper steps in that direction and appointed an expert as Director of

Sericulture, which undoubtedly improved the conditions prevailing in the silk industry. An industry which was vaguely scattered before became centralised, and the difficulties of management became much less under the State control. Unfortunately no scheme has been introduced to develop a suitable labour organisation—a factor which plays a very important part in modern industrialism. /

In the present chapter we have considered the development of the silk industry in Kashmir, and have pointed out some of its economic features which we shall deal with at length in another part of this volume. As stated before, we shall now give a brief sketch of the geographical distribution of the silk-producing industry in the world. From a commercial point of view, it is necessary to specify the sources from which the silk-manufacturing countries of the world draw their supplies of raw silk. These sources will occupy our attention in the next chapter.

PART II

CHAPTER III

GEOGRAPHICAL DISTRIBUTION OF THE SILK- PRODUCING INDUSTRY

IN the previous chapters we have traced the history of the silk industry and trade, and have also given an account of the recent development of silk culture in Kashmir. We have now to consider the present sources of the world's supply of raw silk. This object can be achieved best by studying the geographical distribution of the silk-producing industry. It must, however, be remembered that the geographical distribution of this industry is not independent of the economic conditions of production and, therefore, these two parts of the subject are so closely related to each other that an examination of the former must lead to a discussion of the latter.

Taking the principal areas of production into consideration, we find that the silk-producing industry follows an interesting geographical distribution. The useful textile fibre, commercially known as raw silk, is produced not only in Asia but in Europe as well, and generally speaking, one might say that the silk-producing industry flourishes at the present time in Japan, in China, and in some of the European countries. But this statement is very vague, and does not convey a definite idea of the actual distribution of the silk-producing industry. It is, therefore, necessary to adopt a systematic geographical division with special reference to the main sources of the world's supplies of raw silk.

There are three main sources from which the consuming markets of the world receive their supplies of raw silk. The first and the most important source is the Far East, which is represented by Japan and China. These two countries are now the principal suppliers of the world's requirements of raw silk.

From a geographical point of view, the second important source of raw silk may be divided into two parts, Asia Minor and the Levant. The former includes Turkey-in-Asia (Broussa), Syria, Persia and Turkestan; and the latter comprises the Balkan States (Bulgaria, Serbia and Roumania), Adrianople, Greece and Crete.

The third important source of raw silk is in Europe, where Italy and France are the two chief silk-producing countries. Russia, Austria-Hungary and Spain are also producers of raw silk, but the supplies from these countries do not play a very important part in the world's silk market.

Another source of raw silk which has not been considered under the above geographical distribution is India, excluding the territories of Jammu and Kashmir. Although the production of raw silk in India has received a severe blow by the ever-increasing competition of the Far-Eastern silks, there is still a promising future for the resuscitation of the silk-producing industry.

The brief sketch of the geographical distribution of the silk-producing industry given above does not explain the individual distribution of the industry in each country. At this point, therefore, it will be necessary to examine the distribution of the silk industry in each country separately, so as to give an idea of its economic importance in each case.

Japan.—The Japanese silk-producing industry has greatly extended in recent years. The rearing of the silkworm is practised chiefly in two islands, the Island of Nippon and the Island of Yezo, but the bulk of the raw silk exported from Japan is produced in the provinces of Djo-chiou, Sin-chiou and Ko-chiou. The reeling industry is a very important branch of the Japanese silk-producing industry, and is organised mainly on European lines. The principal centres for reeling are situated in the following provinces: Nagano, Gumma, Yamanashi, Fukushima, Aichi and Saitama.

The latest filatures in Japan have been constructed on the French and the Italian models, and the Mikado's Government have taken a keen interest in the development of this productive industry. It is interesting to notice that the Japanese raw silks are sold in the market under the names of the

provinces in which they are produced, and are also accompanied by other specifications of quality and size, etc.

The Japanese silk-producing industry presents a number of interesting features and thus forms an engrossing economic study, but, owing to its comprehensiveness, it is impossible to do full justice even to its geographical distribution in the present volume. We shall therefore confine ourselves only to necessary references to the economic characteristics of the Japanese silk industry in the succeeding chapters.

China.—The silk-producing industry is practised in nearly all parts of the Chinese Empire and extends from Manchuria, in the north, to the Isle of Hai-nan, in the south. But the provinces in which the sericultural industry is the most predominant are Cheh-kiang, Kiang-su, Sze-chuen and Shan-tung (Chan-tong).

A large variety of raw silks is produced in China; the variations in the qualities and colours of the produce is due largely to the variations in the races of the silkworm reared. The distinguishing characteristics of a particular kind of raw silk are based on the name of the locality in which it is produced, and the market name is also derived from the name of the producing province. The Chinese method of grading and naming raw silks is almost similar to the Japanese method.

The reeling of raw silk is carried on in nearly all the silk-producing provinces of China, but the major part of it is still conducted on indigenous lines. Every silk merchant and every small filature has its own special mark, which accompanies the bale of raw silk and distinguishes this particular bale from the others.

The filatures organised on modern European lines are nearly all established in the neighbourhood of Nankin, Shanghai, and Canton. These filatures reel some of the finest qualities of raw silks and contribute largely to the supplies received in the European and the American markets. The classification of the various kinds of these filature raw silks is complicated and demands particular attention. In the fourth section of this book (when dealing with the economic aspects of consumption of raw silks) we shall examine in detail the classification of the Chinese raw silks.

Asia Minor and the Levant.—The silk-producing industry of Turkey-in-Asia is of considerable importance, chiefly owing to its nearness to the European silk industry. The province of Broussa is the principal producing area. In times of cocoon shortage, Broussa has rendered valuable service to the Italian and the French reeling industries by exporting large quantities of cocoons to these countries. The Brucian cocoons are generally of a very fine quality and find a ready market in Milan and in Marseilles.

The reeling industry in Broussa is comparatively small. According to M. Dubedois,¹ the French Vice-Consul at Beyrout, there were 115 filatures in 1907 producing a total of 500,000 kilos of raw silk. These raw silks are sold mainly in the Lyons market, whence they are exported to Great Britain and other countries.

In Persia and Turkestan the silk-producing industry has been practised from very early times, but very little information is available on its present extent and distribution. It appears from occasional references that the methods employed in silk production in these two countries are still primitive, and the industry is more or less scattered.

Among the Balkan States Roumania takes the lead in the development of the silk-producing industry. The sericultural and the reeling industries are both making steady progress. Serbia and Bulgaria also produce small quantities of raw silk, but it is not possible to give an account of the distribution of the industry in these countries.

Italy.—The Italian silk-producing industry is a striking illustration of skill and efficiency. At the present time "Italy ranks third as to the quantity of marketable raw silk and first as to the quality." The industry extends from the north to the south, and cocoons are produced more or less in nearly all the provinces. With the continued efforts of the Italian sericulturists, the silk-producing industry has now reached a stage of perfection.

The distribution of the silk-producing industry is not even

¹ M. Beauquis in his "*Histoire Economique de la Soie*," briefly refers to the silk-producing in Broussa and quotes the figures given above. See p. 459 of his book.

throughout Italy. The northern provinces of Lombardy, Venetia and Piedmont contribute more than 77 per cent. to the total Italian production of cocoons, the central provinces produce about 17 per cent., and the southern provinces (including Sicily) contribute about 5 per cent. The following table shows the shares contributed by each of the three main regions to the total Italian production of cocoons during the years 1910 to 1914.¹

Region.	1910.	1911.	1912.	1913.	1914.	Average 1910 to 1914.
<i>Northern Provinces, including :</i>	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Lombardy and Liguria .						
Venetia }	75·7	75·6	80·9	79·1	77·1	77·8
Piedmont }						
<i>Central Provinces, including :</i>						
Emilia }	18·2	19·0	15·0	16·3	17·6	17·2
Umbria and the Marches .						
Tuscany }						
<i>Southern Provinces, including :</i>						
Naples }	6·1	5·4	4·1	4·1	5·3	5·0
Calabria and }						
Sicily }						

It appears from the last table that the industry is concentrated mainly in the northern provinces of Italy. This concentration is due to the favourable climatic and economic conditions prevailing in Northern Italy. The central provinces rank second in order of importance and the southern provinces contribute the least share.

The reeling industry follows the same distribution as does the cocoon-producing industry. Filatures have been established in almost all the important cocoon-producing areas. Lombardy possesses the largest number of filatures, Venetia and Piedmont come next. The other provinces also possess reeling centres. Mr. Leo Duran, in his book entitled

¹ These figures have been taken from "Statistique de la Production de la Soie," Récolte de 1914, Lyon.

DISTRIBUTION OF THE SILK INDUSTRY 51

"Raw Silk,"¹ gives the following list of reeling centres in Italy :—

Province and Town:	Number of Filatures.	Number of Basins.
<i>Lombardy :</i>		
Milan	134	10,000
Pavia	22	1,350
Como	143	10,500
Sondrio	3	220
Bergamo	88	7,500
Brescia	49	2,700
Cremona	42	3,000
Mantova	9	350
<i>Venetia :</i>		
Verona	11	450
Vicenza	46	2,500
Padova	5	390
Venezia	2	150
Trento	45	2,200
Udine	87	3,000
Belluno	2	50
<i>Piedmont :</i>		
Torino	41	2,100
Cuneo	47	3,000
Alessandria	36	2,500
Novara	7	450
<i>Liguria :</i>		
Genova	2	50
<i>Emilia :</i>		
Piacenza	3	80
Reggio	2	175
Modena	2	130
Ravenna	3	150
Forli	5	225
<i>Tuscany :</i>		
Firenze	21	600
Lucera	48	650
Arezzo	14	550

¹ "Raw Silk," a practical handbook for the buyer, by Leo Duran. published by the Silk Publishing Company, New York, 1913., pp. 48—49.

Province and Town.	Number of Filatures.	Number of Basins.
<i>Umbria and the Marches :</i>		
Peruggia	1	95
Pesaro	45	850
Ancona	30	850
Macerata	9	200
Ascoli	2	50
<i>Campania :</i>		
Caserta	2	95
<i>Calabria :</i>		
Cosenza	16	450
Catanzaro	1	60
Reggio	29	1,350
<i>Sicily :</i>		
Messina	8	450
Total ¹ . . .	1,062	59,470

The total number of reeling establishments in Italy, according to the above list, is 1,062, and that of reeling basins employed in the filatures, 59,470. Judging from the present extent of the Italian reeling industry this estimate seems to be very low. M. Beauquis estimates the number of reeling establishments in Italy at about 18,000 and the number of working basins at about 120,000.² These two estimates are obviously widely divergent ; if the former seems to be too low, the latter appears to be too high. It is, however, quite possible to explain the difference in these two estimates.

The concentration of the Italian reeling industry commenced after the year 1880, when the smaller filatures were amalgamated into larger ones and the number of basins in the larger establishments were greatly increased. This reorganisation of the reeling industry caused a reduction in the number of filatures, but considerably raised the number of

¹ The total numbers of filatures and basins given in the book referred to on the last page are 1,032 and 59,565 respectively. The actual totals are 1,062 and 59,470, which show that there is some error in printing.

² "Histoire Économique de la Soie," p. 450.

reeling basins so as to minimise the difficulties of management. It is therefore possible that Mr. Duran's estimate takes into account only the larger filatures, organised on modern lines and containing the greater number of reeling basins, while M. Beauquis includes in his estimate even the smaller filatures which are still working in some parts of Italy. It will be seen that the difference between the total number of filatures exhibited by the two estimates is far more in proportion than the difference between the number of basins, which indicates that our assumption is justifiable.

Studying the above list of filatures from a geographical point of view, we find that the greatest concentration of the reeling industry takes place in the northern provinces of Italy, which are also the largest producers of cocoons. Milan and Como (in Lombardy) possess not only the largest number of filatures but also the largest number of basins.¹ As regards the total number of basins the province of Lombardy ranks first in Italy, having more than 35,000 working basins in 490 filatures. In other words, Lombardy possesses about 60 per cent. of the total Italian basins. The provinces of Venetia and Piedmont rank second and third respectively, having 8,740 and 8,050 reeling basins. Thus about 88 per cent. of the Italian reeling industry is concentrated in three northern provinces.

The distribution of the reeling industry and its comparison with the cocoon-producing industry in Italy, may be summed up in the table on p. 54.

It is interesting to note in the table on p. 54 that the percentage distribution of filatures in the three main regions of Italy corresponds to the percentage of total average production of cocoons in those regions, while the percentage concentration of basins in the northern provinces is greater than the percentage of total average production of cocoons in these provinces. In addition to the quantities of cocoons produced locally, the northern provinces consume the greater part of the imports of cocoons from Asia Minor, the Levant, Spain and the Far East.

¹ It is the number of reeling basins that determines the actual concentration of the industry.

DISTRIBUTION OF THE REELING INDUSTRY IN ITALY.

Region,	Number of Filatures.	Percent- age of Total Number of Filatures.	Number of Basins.	Percent- age of Total Number of Basins.	Average Produc- tion of Cocoons 1910-1914. Percentage of Total.
<i>Northern Provinces :</i>		Per cent.		Per cent.	Per cent.
Lombardy and Liguria	821	77.4	52,460	88.2	77.8
Venetia }					
Piedmont }					
<i>Central Provinces :</i>					
Emilia }	185	17.3	4,605	7.7	17.2
Umbria and the					
Marches }					
Tuscany }					
<i>Southern Provinces :</i>					
Campania. . . . }	56	5.3	2,405	4.1	5.0
Calabria and . . }					
Sicily }					

France.—The French silk-producing industry is concentrated almost entirely in the provinces lying south of Lyons and north of the southern coast line. The provinces situated in the north and north-west of Lyons do not produce any raw silk, and therefore Lyons marks the northernmost boundary of the silk-producing districts in France.

The following table (on p. 55) shows the distribution of the cocoon-producing industry in France and the percentage contribution of each province to the total French cocoon crop.¹

The provinces of Ardèche, Gard and Drôme are the principal suppliers of cocoons for the filatures. In Ardèche, the cocoon-producing industry is practised chiefly in the southern part, while in Gard it is practised mainly in the

¹ The percentages given in the table (on p. 55) are based on the 1914 cocoon crop. Although there are variations in the amounts produced in different years in each province, the relation of these amounts to the total annual French production of cocoons does not vary much, and therefore the 1914 crop may be safely taken as a basis of analysis. The detailed figures are given in "Statistique de la Production de la Soie," Récolte de 1914, p. 13.

Province.	Percentage of Total Production.
	Per cent.
Ardèche	28.0
Gard.	26.5
Drôme	18.2
Vaucluse	8.8
Var.	5.5
Isère.	3.5
Bouches-du-Rhône	2.5
Basses-Alpes	2.0
Lozère	1.6
Hérault	1.2
Other provinces	1.3
Corsica9
Total	100.0

mountainous regions. In the province of Drôme, cocoons are produced in all parts except those which lie in the mountains. In the other provinces (particularly in the provinces of Var, Vaucluse and Basses-Alpes), cocoons are reserved mainly for the production of the seed.¹

As regards the distribution of the reeling industry in France, we find that nearly all the important cocoon-producing areas possess filatures. The principal reeling establishments are, however, situated in the province of Gard and in the environs of Marseilles. In the former Alais is a very important reeling centre.

The province of Ardèche also possesses a large number of filatures. The principal markets for cocoons in this province are Privas, Chomérac, Flaviac, Largentière, Joyeuse and Tournon. The provinces of Drôme, Vaucluse Isère and Bouches-du-Rhône have important reeling establishments and markets for cocoons, which are despatched from the producing districts to the nearest centres soon after the harvest is ready.

It is not possible to give the distribution of the French

¹ The eggs of the silkworm used for purposes of reproduction, are technically known as the "seed."

reeling industry according to the number of filatures and the number of reeling basins in each area, as no definite information is available on that subject. The total number of reeling basins in France was 13,847 ¹ (in about 250 filatures) in 1910. In 1912 there were only 165 reeling establishments in activity.² This decline was probably checked during the year 1913 and the first half of 1914, but at the outbreak of the war a large number of filatures were again closed. There is no doubt that in recent years some of the old filatures have been closed up, and thus there has been a reduction in the total number of the reeling establishments in France, but at the same time some of the new establishments have extended their plant and have greatly increased the number of reeling basins. Judging from the conditions prevailing before the war, we may estimate the number of reeling basins in the French reeling industry ³ at about 14,000.

It is evident from the figures given in the last paragraph that the French reeling industry is much smaller than the Italian reeling industry. As a matter of fact, the relative strength of the Italian reeling establishments (based on the number of basins) is showing considerable increase every year, while that of the French filatures is declining. However, up to the present time the French silk-producing industry has maintained its good reputation by dint of its efficient organisation.

¹ See "Les Vers a Soie," (p. 175), by M. Antonin Rolet, published in Paris in 1913.

² *Cp.* Diplomatic and Consular Reports, Annual Series, No. 5324, for the year 1914, p. 12.

³ The figures given by M. Beauquis ("Histoire Économique," pp. 117—118) showing the decline in the number of filatures and in the number of reeling basins in France, might be quoted here for purposes of reference.

Year.	Number of Filatures.	Number of Basins.
1853. . . .	600	30,000
1884. . . .	not given	12,000
1890. . . .	" 238 "	10,000
1892. . . .	238	10,451
1896. . . .	280	13,395
1906. . . .	224	11,000

Russia.—The most important centres of the Russian silk-producing industry are situated in the Caucasus. The following are the principal cocoon-producing districts:—Zakhatali, Elizabetopol, Erivan and Bakou.

The reeling industry in the Caucasus is very small. There are perhaps a small number of filatures in some of the centres, but owing to the absence of information as to their distribution, it is impossible to give further details of their location. It might, however, be added that the exportation of cocoons from the Caucasus to Italy indicates that only a limited quantity of the raw material is retained by the Russian reeling industry.

*Austria-Hungary.*¹—The development of the Austrian silk-producing industry is of a recent date. Sericulture was first introduced into Austria about the middle of the seventeenth century and has been making continued progress since its introduction, chiefly owing to the State help.²

The cocoon-producing industry is practised as a domestic industry by the agricultural classes of the southern provinces of Austria. Practically the entire harvest of cocoons is produced in Southern Tyrol and in the counties of Görz, Gradiska and Istria. The bulk of the Austrian production of cocoons is exported from Trieste.

The reeling industry is concentrated partly in Trent and partly on the shores of the Adriatic Sea. The filatures, which are subsidised by the State, are of the latest type and have been established mainly on Italian lines. As the produce of the Austrian sericultural industry is generally exported to foreign countries, large quantities of cocoons are imported into Trieste from Turkey-in-Europe, to supply the demand for the raw material of the Austrian reeling establishments.

In Hungary the sericultural industry is a State monopoly. The mulberry trees have been planted in more than 5,000 parishes by the Government department, and the silkworms'

¹ For an account of the Austro-Hungarian silk-producing industry, I am obliged to M. Rolet's description in his book "*Les Vers a Soie*."

² The measures taken by the Austrian Government in promoting the silk-producing industry are fully discussed in Chapter XIII., p. 170.

eggs (*i.e.*, the seed) are distributed free among the rearers. Szekszárd is the principal centre of the sericultural industry, but cocoons are also produced in Croatia and other provinces.

The harvest of cocoons is bought by the Government and is ultimately distributed among the filatures in Tolna and in other places. Only those cocoons are exported to Milan and Marseilles which cannot be utilised by the Hungarian reeling establishments. The filatures are all of a very modern type, and are entirely controlled by the Government during the first year of installation, in order to allow the reelers to complete their period of apprenticeship. After this, these establishments are let out to responsible directors for a period of at least ten years.

The system of control described above was followed by the Hungarian Government before the war. It is difficult to say what developments, if any, have taken place during the last four years, and what course the reeling industry would take after the restoration of peace.

Spain.—The Spanish silk-producing industry is distributed partly in the southern and partly in the eastern provinces. It is practised mainly by the agricultural families possessing mulberry trees on their lands. In spite of the existence of special official centres for the benefit of the rearers, the cocoon-producing industry does not appear to be in a flourishing condition.

The agricultural communities inhabiting the plains of Murcia, Valencia and Aragon are the principal producers of cocoons. The provinces of Almeria, Granada and Estremadura also contribute to the total Spanish production.

The reeling industry in Spain does not present any interesting feature. Its gradual decline has greatly reduced the importance of Spanish raw silks in the world's markets. In 1907 only thirty-five filatures, containing about 1,000 reeling basins were in activity. It is believed that the number both of filatures and of reeling basins has remained more or less stationary since that year. If, therefore, the present reeling industry in Spain depends for its output on

about thirty-five small filatures, we can easily conclude that it is not in a strong enough position to become an important supplier of raw silk.

*India.*¹—It is not an easy task to give a brief sketch of the geographical distribution of the Indian silk-producing industry. Raw silk is produced more or less in nearly all the provinces, and the industry is widely scattered in different parts of the country. It is wholly a cottage industry and its products are consumed mainly by the Indian looms. The dispersion of the industry is made more conspicuous by the absence of a definite organisation, and its isolation from other industries of a similar nature. In spite of these drawbacks the Indian silk-producing industry is of especial economic interest, partly owing to its extent and partly to its future potentialities.

The principal silk-producing areas in India that deserve our attention are Mysore, Bengal, Madras, Burma and Assam. In recent years, new areas, such as Patiala and the Punjab, have entered the field of industrial activity, and have demonstrated by means of successful experiments that silk-production is not only possible, but also profitable from a commercial point of view.

The silk-producing industry in Mysore is now being fostered by the State, and enjoys the advantages of expert technical advice. The bulk of the cocoons produced are reeled by means of indigenous appliances, though lately improved reeling systems, such as the Japanese, have been introduced. The raw silk is consumed not only by the local looms, but also finds an extensive and popular market in Madras. There is no regular export trade in raw silk, though occasionally a few bales are sent to England. The waste silk produced during the reeling processes is largely exported to Europe.

In Bengal the silk-producing industry is not in a flourishing condition at the present time. Cocoons are produced in different parts of the province and reeled mainly by the

¹ The geographical distribution of the Indian silk industry (excluding the Kashmir silk industry), is based chiefly on Professor Lefroy's investigations.

villagers in their own indigenous ways. The former organised reeling industry has ceased to exist, and now there are only two or three filatures reeling raw silks for foreign markets. The bulk of the product of the indigenous reeling industry is used in India.

The Madras silk-producing industry is very closely allied to the Mysore industry. The only area in Madras now known to produce silk is situated on the borders of Mysore State and is geographically part of the Mysore plateau.

The silk-producing industries of Assam and Burma are comparatively small and do not attract much attention. In Assam particularly, greater importance is attached to the production of Eri¹ silk than to mulberry silk. From our present point of view these two areas do not present any interesting features.

The brief geographical sketch of the Indian silk-producing industry given above, does not show the relative concentration of the industry in each province. Unfortunately no official statistics of the production of raw silk in India are available, and it is therefore very difficult to judge the importance of each producing area in its relation to the industry as a whole. The only possible way out of the difficulty is to refer to approximate figures of production compiled by different investigators. The most reliable of these figures are those given by Professor Lefroy,² and are embodied in the following table (on p. 61).

According to the figures given in the table on p. 61, Mysore is the largest silk-producing area in India, producing about 53 per cent. of the total Indian production of raw silk. Bengal contributes about 27·5 per cent. and Madras about 18 per cent. to the total. Considering that the area in square miles and the population of the Mysore State are much smaller than of either Bengal or Madras, and that the amount of production is greater, we may conclude that the

¹ Eri silk is obtained from a domesticated multivoltine worm (*Attacus ricini*), which feeds on the castor-oil plant. This worm yields fibre, which is inferior to the fibre obtained from the mulberry silkworm (*Bombyx mori*).

² These figures are given by Professor Lefroy in a paper read before the Royal Society of Arts on February 15th, 1917.

DISTRIBUTION OF THE SILK INDUSTRY 61

TABLE SHOWING THE APPROXIMATE PRODUCTION OF RAW SILK
IN THE PRINCIPAL SILK-PRODUCING PROVINCES IN INDIA.

Province.	Production of Raw Silk in Lbs.	Percentage Contribution.
		Per cent.
Mysore . . .	1,152,000	52·82
Bengal . . .	600,000	27·52
Madras . . .	400,000	18·34
Burma . . .	15,000	·69
Assam . . .	12,000	·55
Punjab . . .	1,800	·08
Total . .	2,180,800	100·00

silk industry is more concentrated in the former than in either of the latter provinces.¹

The quantities of silk produced in the other three provinces are comparatively very small and do not make a great change in the position of the Indian silk industry considered as a whole.

We have now finished the summary of the geographical distribution of the silk-producing industry in the world and have indicated its distribution separately in each country. In order to show the relative importance of production in each of these countries and to give prominence to the world's supply of raw silk, we may consider the quantities of raw silk produced by different countries in a concise table. It may, however, be noted that in the case of Asia Minor, Turkey, and Austria-Hungary, no statistics of production are at present available for the period of the war, and under these circumstances it would be advisable to refer to their average annual production of raw silk for a pre-war period of five years. In forming an exact estimate of the world's produc-

1	Area in square miles.	Population.
Bengal . . .	78,699	45,483,077
Madras . . .	142,330	41,405,404
Mysore . . .	29,475	5,806,193

tion of raw silk, another difficulty is created by the complete absence of statistics of production in Japan and China. As a rule, only exportations of raw silk from these countries are shown in the various statistical tables.

The following table (on p. 63) showing the world's production of raw silk has been compiled from the figures published by the Syndicate of the Union of Silk Merchants of Lyons, in their annual publication, "*Statistique de la Production de la Soie, en France et a l'étranger.*"

The figures representing the production of raw silk in the table on p. 63 do not require any comment. We have already discussed the importance of the Far Eastern countries as regards the supplies of raw silk. It is sufficient to point out here that the exportation alone of raw silk from Japan far exceeds the total production in the European countries. The internal consumption of raw silk in Japan and China is enormous, which indicates that the total amount of production in these two countries must be at least double the amount of exportations. The silk-producing capacity of the other countries of the world has been already commented on in the previous pages and need not be repeated here.

We have incidentally shown in the brief account of the geographical distribution of the silk-producing industry, that certain countries are more favourably placed than others as regards their capacity of producing raw silk. In some cases the industry is concentrated in small areas, while in others it is scattered in different parts of the producing countries. Again, in some particular cases the distribution is more or less uniform. The question, therefore, arises, what are the economic conditions governing the distribution of the silk-producing industry, or in other words, we might ask, what are the economic conditions under which it is possible to produce raw silk on a commercial scale? The answer to the last question will explain not only the fundamental conditions of distribution of the silk-producing industry, but also the causes of its localisation. In the next chapter we shall state the chief economic factors in production and their influence on the development of the silk-producing industry.

DISTRIBUTION OF THE SILK INDUSTRY 63

Producing Countries of the World.	Average Production of Raw Silk, 1909 to 1913.
<i>The Far East.</i>	
	Lbs.
Japan, exportations from Yokohama	21,850,000
China, " " Shanghai	12,551,000
" " " Canton	5,135,000
Indo-China exportations	20,000
Total	39,556,000
<i>Asia Minor and the Levant.</i>	
Turkestan and Central Asia (exportations)	625,000
Persia (exportations).	546,000
Turkey-in-Asia (total)	2,482,000
Turkey-in-Europe (Adrianople)	642,000
Balkan States (Bulgaria, Serbia and Roumania)	374,000
Greece, Salonica and Crete.	183,000
Caucasus	1,021,000
Total	5,873,000
<i>Europe.</i>	
Italy	8,507,000
France	990,000
Austria	411,000
Hungary	315,000
Spain	180,000
Total	10,403,000
<i>India.</i>	
India (excluding Kashmir).	2,200,000 ¹
Kashmir	169,000 ²
Total	2,369,000
Grand total	58,201,000

¹ Approximate estimate.

² The estimate for Kashmir is based on the figures given in the Administration and Sericulture Reports of the State.

CHAPTER IV

THE ECONOMIC ENVIRONMENT

WE have already stated that the geographical distribution of the silk industry leads to the determination of the economic conditions under which the production of raw silk has prospered in the principal silk-producing countries of the world. A thorough investigation of the subject shows that, apart from the investment of a large capital and the maintenance of a suitable organisation, natural surroundings play a very active part in the development of the silk-producing industry. It is a matter of common knowledge that the prosperity of any industrial enterprise depends in general on some important economic factors, which may be partly the work of nature and partly the result of human energy. The same principle holds good as regards the well-being of the silk-producing industry, and the production of raw silk in any country is always determined by the quality of the economic factors existing in the different areas of production. In the present chapter we shall briefly examine the nature of these factors and their relative importance to the silk-producing industry.

We shall first consider the fundamental factors which form a part of the economic environment necessary for the production of raw silk. These factors may be tabulated as follows :—

- (1) The presence of suitable climatic conditions in the silk-producing countries ;
- (2) The abundance of mulberry trees, whether natural or cultivated.
- (3) The availability of a large supply of agricultural or semi-agricultural labour.
- (4) The presence of facilities for obtaining cheap power, whether water-power or steam and electric power.

Let us now examine separately the economic importance of each of these factors. First of all, we shall devote our attention to the presence of suitable climatic conditions in a silk-producing country and indicate the part played by these conditions in the successful production of raw silk.

THE CLIMATIC CONDITIONS

Climate is the most predominant factor in the development of sericulture in any country. It has been maintained by some experts that without suitable climatic conditions it is impossible to produce silk, as sudden variations in temperature are fatal to the rearing of the silkworms. Artificial methods may be adopted to regulate heat, cold or moisture, but still there is always a danger of deviating from the natural requirements of temperature, and, moreover, there is no certainty of cheap production. Even in those countries where the silk-producing industry has flourished, the occasional cessation of suitable climatic conditions causes great damage to the crop of cocoons and brings about an industrial depression. It is therefore essential that during the cocoon-producing season, the climatic conditions should not only be favourable but constant as well.

Though it is not desirable to indulge in the technical details of sericulture, yet it will be found necessary to discuss here the limits of temperature and of other conditions, which form a part of the economic environment and are essential to the production of silk from the point of view of economic utility.

There are four important points which determine the limits of temperature and moisture in regard to their application to sericulture. These are (a) mean maximum temperature, (b) mean minimum temperature, (c) mean humidity, and (d) temperature of the wet-bulb. Although each of these four conditions has definite limits within which sericulture can be successfully practised, the limits of the third condition are particularly important, as temperature has been regarded by some experts as a less important factor than humidity. The particular importance attached to

humidity is explained by considering the wet areas of production, where the use of trays for rearing purposes is indispensable. The cost of these trays bears heavily on the cost of production of silk and becomes a serious item when the trays are used only for a single rearing.¹ This does not apply to dry areas in which trays can be easily dispensed with.

With regard to the practical limits of the four conditions given above we shall refer to authorities on sericulture. According to Professor Lefroy, hibernation should be three months at 32° F., after which the temperature should rise at the rate of 1.8° F. a day to 72° F. Humidity should be 50 per cent.² But it may be noted here that variations in the required temperature are regulated by variations in humidity and, therefore, we cannot fix 32° F. as the minimum limit. For instance, in Japan the temperatures recommended vary with the monthly variations in humidity, and are as follows: December, under 40° F.; January, under 35° F.; February, under 40° F.; March, under 45° F.; April, under 50° F.; and then fourteen days before the hatching of the eggs the temperature is raised to 55°, after which it is raised to 62° F. with a daily increase of 1° and finally to 72° F. with a daily increase of 2° F., so that a minimum temperature of 55° F. is brought up for suitable hatching.

The next stage is the rearing of the worms, for which the best temperature varies from 65° F. to 75° F. according to L'Arbousset, a French sericulturist. If there is an excessive humidity in the air, the chrysalides die quickly when exposed to a temperature of 112° F. or more. According to Professor Lefroy the humidity should be under 70 per cent. at the spinning time and the temperature should be 75° to 80° F.; if both of these conditions exceed the limits the cocoons reel badly.

It has been pointed out before that artificial means may

¹ The cost of trays needs to be spread over a series of rearings before it can give really economical results, but this again depends upon the race of the silkworm reared.

² See the technical section of "The Silk Industry in India," by Lefroy, Vol. I., and also Vol. III., Appendices.

bring about the desired conditions of temperature and humidity, but the cost of production rises so much that economic production becomes impossible. For all practical purposes, there are definite natural limits of climatic conditions within which the production of raw silk on a commercial scale can succeed, and these conditions may therefore be regarded as forming an important part of the economic environment. Putting the above conditions in a nutshell the following rules determine the impossibility of sericulture in a specified area :—

- (a) Mean maximum temperature for the month 100° F. or over ;
- (b) Mean minimum temperature for the month 50° F. or under ; and
- (c) Mean wet-bulb 75° F. or over.

In order to illustrate the utility and the practical working of these conditions, it is necessary to state the climatic conditions of the different silk-producing countries of the world. But owing to the absence of detailed information regarding the exact climatic conditions of some of the silk-producing countries, it is impossible to discuss all those countries which have been named in the last chapter. As regards China, for instance, our knowledge of her climatic conditions is based mainly on the observations made by the missionaries and other travellers, and the information contained in their accounts is neither exact nor reliable for scientific purposes. As, however, China is one of the leading silk-producing countries of the world, it may be safely assumed that the mean minimum temperature in the silk-producing provinces is generally about 55° F. and the mean maximum about 85° F., with conditions of favourable humidity.¹ The exact climatic conditions of the silk-producing countries in Central Asia are not known, and it is therefore difficult to compare them with those of any other country. Interesting information is, however, available regarding the exact climatic conditions prevailing in the typical silk-producing districts of France, Italy and India ; this may be suitably quoted here.

¹ Also see "China Illustrated," Vol II., p. 10, by Allom.

In the following tables compiled from various sources, elevation and annual rainfall ¹ are given at the corners. In the central column, four lines are given for each town, representing the four limiting factors which determine the suitability of sericulture in a certain area. The first line gives the mean maximum temperature for each month from January to December, the second line gives the mean minimum temperature; the third line represents the mean humidity, and the fourth the mean wet-bulb. In the end column suitable months are indicated, and thus it is possible to point out at first sight what time of the year is suitable for silk culture in the different districts of the three countries. Suitable months are enclosed in brackets.

INDIA.

Stations.	(a) Mean Max. Temp. for each month, ° F. (b) Mean Min. Temp. for each month, ° F. (c) Mean Rel. Humidity. (d) Wet bulb, ° F.																Elevation in Feet and Remarks.
Shillong (Assam) Rainfall (80·6).	61	62	70	74	74	74	76	75	75	72	67	62	39	42	15	57	4,920', April-June. Hill District.
	70	68	52	61	72	83	57	87	85	79	75	70					
	Wet bulb not given.																
Gauhati (Assam) .	74	78	85	87	88	89	90	90	90	87	82	76	50	52	59	67	196', Nov.-Dec. Feb.-March. Valley.
	96	89	79	82	86	89	88	88	88	89	93	97					
	Wet bulb not given.																
Midnapore (Bengal)	81	85	95	101	100	94	90	90	90	89	85	80	56	61	69	76	149', Nov.-Feb.
	71	68	67	69	74	82	86	87	86	79	71	68					
	Wet bulb not given.																
Berhampore (Ben- gal) rainfall, 55·72."	77	81	92	99	97	92	89	89	89	88	82	77	53	56	66	74	67', Nov.-March. suitable for more than one crop.
	86	80	70	74	81	87	91	91	89	85	84	84					
	58	59	67	73	77	79	80	79	79	75	67	59					
Bogra (Bengal) .	76	80	90	96	92	89	89	89	89	87	83	77	52	54	63	72	75', Nov.-March. More than one crop.
	84	78	73	77	81	87	88	88	87	84	83	83					
	Wet bulb omitted.																

¹ The annual rainfall does not determine the suitability of a certain area for practising sericulture, but it is an index of humidity to a certain extent. The elevation above the sea-level indicates the suitability of the producing area. Those areas which are close to the sea-level are not regarded as suitable for the production of silk.

INDIA—*Continued.*

Stations.	(a) Mean Max. Temp. for each month, ° F. (b) Mean Min. Temp. for each month, ° F. (c) Mean Rel. Humidity. (d) Wet bulb, ° F.	Elevation in Feet and Remarks.
1 Srinagar (Kashmir) rainfall, 27.65".	41 43 56 67 (76 82 85 85) 79 70 61 48 27 28 37 45 (52 58 64 63) 54 41 32 28 89 88 88 85 (83 82 84 85) 86 86 87 88 31 33 43 52 (59 65 69 69) 62 51 42 35	5,204', May-June-July; typical area for one crop.
Bangalore (The Deccan) rainfall, 36.6".	(81 86 91 93 92 85 82 82 82 82 80 79) (57 60 65 69 69 66 66 66 65 65 62 59) (79 71 64 71 75 80 85 85 86 82 78 79) (60 61 63 68 69 68 67 68 68 67 64 61)	3,021', ideal conditions throughout the year.
Mysore (South), rainfall, 29.6". ²	(84 89 94 95 92 85 82 83 84 84 83 82) (60 63 67 70 70 68 67 67 66 67 64 60) (73 69 69 74 76 80 82 82 82 83 77 75) (62 63 65 69 70 69 68 68 68 68 65 63)	2,518', ideal conditions.

FRANCE.³

Stations.	(a) Mean Max. Temp. for each month, ° F. (b) Mean Min. Temp. for each month, ° F. (c) Mean Rel. Humidity. (d) Wet bulb, ° F.	Elevation in Feet and Remarks.
Marseilles (Bouches-du-Rhône) rainfall, 23".	53 56 59 66 72 (78 84 82 77) 67 60 53 36 37 40 45 50 (57 61 60 56) 49 43 37 72 69 65 65 65 (65 62 65 71) 74 76 73 40 41 44 49 55 (61 64 64 60) 54 47 41	248', June to September.
Toulon (Var) rainfall, 28".	51 55 58 64 69 (77 82 80 77) 68 69 54 40 41 45 50 55 (62 67 65 62) 55 50 42 71 69 66 65 67 (65 61 66 67) 75 77 73 42 44 46 51 56 (62 65 66 62) 56 51 44	June-September.
Lyons (Rhône) rainfall, 33".	40 43 53 61 69 77 (79 79) 72 65 49 44 29 30 34 41 48 54 (56 56) 50 46 38 35 89 80 73 70 70 72 (73 75) 82 85 87 88 34 36 40 47 53 59 (63 62) 58 49 41 36	574', July-Aug., June-Sept., minimum and wet bulb low.
Montpellier (Hérault) rainfall, 31".	52 53 58 64 72 (82 85 87 78) 69 59 51 31 35 38 43 50 (56 58 58 50) 48 41 35 82 83 77 76 78 (75 75 71 70) 86 82 84 39 41 45 51 57 (63 67 66 60) 55 46 39	118', June-Sept.

¹ Professor Lefroy's Report, Appendix, p. 27. The figures given for Srinagar fairly represent the conditions in the outer valleys. Srinagar is typical of that large area which produces one crop.

² Figures obtained from (a) "Memoirs of the Indian Meteorological Department," Vol. XXII., Part III., by G. T. Walker (1914). (b) also from Professor Lefroy's Report, Appendix.

³ Rainfall from "Le Movement Géographique," Treizieme Année No. 5 (1896), p. B. 172.

FRANCE—Continued.

Stations.	(a) Mean Max. Temp. for each month, ° F. (b) Mean Min. Temp. for each month, ° F. (c) Mean Rel. Humidity. (d) Wet bulb, ° F.												Elevation in Feet and Remarks.
Perpignan (Pyre- nées-Orientales) rainfall, 20".	52 38 69 40	54 38 62 41	59 40 65 45	64 45 64 50	70 52 68 56	77 57 63 61	81 61 60 64	82 62 63 64	76 56 68 60	69 51 78 54	60 45 76 47	56 42 69 45	105', June-Sept.
Avignon (Vaucluse) ¹	49 31 79 37	51 33 74 40	58 36 73 46	65 43 70 51	75 48 71 58	82 53 70 64	85 59 70 69	86 59 72 67	79 51 82 63	71 49 89 55	57 40 88 46	51 37 84 39	72', June-Sept.

ITALY.

Stations.	(a) Mean Max. Temp. for each month, ° F. (b) Mean Min. Temp. for each month, ° F. (c) Mean Rel. Humidity. (d) Wet bulb, ° F.	Elevation in Feet and Remarks.
Venice (Venetia) rainfall, 27".	41 46 52 61 70 77 83 82 74 63 52 43 31 35 40 49 57 63 68 66 60 50 41 34 84 82 80 79 79 75 73 73 68 82 82 82 35 38 44 51 59 65 69 68 63 55 42 37	69', May-Sept.
Naples rainfall, 34".	52 54 57 63 71 78 83 83 78 69 60 53 43 44 46 51 58 64 69 69 65 58 51 45 72 71 69 70 67 67 63 64 68 72 73 73 43 44 47 52 57 63 67 67 64 57 51 46	489', June-Sept.
Rome rainfall, 36".	52 55 59 65 73 81 86 86 79 71 60 54 38 40 43 48 55 61 65 65 60 54 46 40 72 69 66 65 61 58 53 55 62 70 73 74 41 43 46 51 57 62 65 65 62 56 48 43	167', June-Sept.
Padua (Venetia) rainfall, 33".	Only mean temperature for each month is given in these cases. 35 39 46 54 62 70 75 73 66 56 45 37 79 74 69 66 64 62 59 62 68 75 78 80 33 37 42 49 56 62 65 65 60 52 42 35	102', June to Sept.
Milan (Lombardy) rainfall, 43".	34 39 47 55 63 71 76 74 67 55 44 37 85 77 66 61 60 58 55 59 66 76 82 82 32 37 42 49 56 62 66 65 60 52 42 35	482', June-Sept.

¹ The figures for France were obtained from the following sources:—

(a) "Annales du Bureau Central Meteorologique De France," Part II., for years 1906-7-8-9-10.

(b) Also from the Meteorological Summary of the London Meteorological Office.

Wet bulb calculated from "Anhaug-Hygrometer," by Tafelu Von J. M. Pernter. "Le Climat. de la France," par G. Birgourdan, 1916.

The figures for Italy were calculated from "Climatologia," Annual means (1874-1904) and "Bollentino Bimensual." "La Temperature in Italia" (1911), pp. 19-22. Torino 1917. "Osservazioni Pluviometriche del Periodo," 1880-1908.

The figures given in the tables need explanation and comment. From an economic point of view there are two main points worth noting : (a) the number of months during which it is possible to produce silk, and (b) the constancy of climatic conditions during those months. On the first point depends the quantity of production and on the second its quality, as the smaller the period during which the production of silk is possible, the smaller is the crop of cocoons. And if during the producing period the climatic conditions do not remain constantly favourable the quality of the crop becomes poor. The tables given in the last few pages indicate clearly the first point but do not touch on the second, and, therefore, introduce a factor of uncertainty which is directed entirely by natural conditions. It is the uncertainty of favourable climatic conditions during the producing period which sometimes renders future estimates of cocoon crops unreliable.

Let us first examine the suitable months for silk production in the four producing areas in India. In Assam and Bengal, four months of the year are best suited for sericulture. In Shillong the mean temperature is low before April and is therefore dangerous for hatching. In Berhampore and Bogra (in the province of Bengal), five continuous months, from November to March, can be utilised for hatching and rearing. This long period offers the Bengal silk-producing industry the opportunity of raising more than one crop, and therefore presents a special advantage in so far as the total amount of production is concerned.

Srinagar represents a typical area for one crop and corresponds with Venice in this respect, only the season in the latter goes right up to September, while in the former it begins to become colder after July. It may be pointed out here that as regards the production of silk, the climatic conditions in the valley of Kashmir (represented by figures for Srinagar) are identical with those of the northern silk-producing provinces of Italy and, therefore, similar races of the silkworm can be reared in these two countries.

The other two important areas in India are represented by Bangalore and Mysore, both of which present the ideal conditions for sericulture. The figures relating to the climatic

conditions in these two places clearly show that silk can be produced throughout the year. The mean maximum temperature in these two cases does not go beyond 100° F. in any month of the year and the mean minimum temperature does not fall below 50° F. The reading of the wet-bulb also remains below 75° F. throughout the year ; so that the atmosphere presents favourable conditions of humidity. It may be mentioned here that, owing to the suitable climatic conditions, these two areas produce a fine quality of silk.

As regards France the most suitable time of the year for silk culture is from June to September, except in the districts surrounding Lyons, in which the mean minimum temperature remains rather low before July and continues to be low after August again, so that only two months can be utilised for sericulture. In the provinces of Var, Vaucluse, Bouches-de-Rhône and Hérault, the climatic conditions are suitable for sericulture during the four months from June to September. The figures given in the tables indicate the natural division of France from a sericultural point of view. Lyons marks the northern economic boundary of the silk-producing provinces, and Toulon lies on the southern boundary line. In France, as in Italy and Kashmir, only one annual crop of cocoons is produced owing to the limited range of the period during which sericulture is possible, and also owing to the climatic conditions which are best suited for the breeding of the univoltine¹ races of the silkworm.

A brief analysis of the figures relating to the climatic conditions in Italy shows that the rearing season extends from June to September, except in the northern province of Venetia where the sericultural operations may be commenced a month earlier. If the figures for the climatic conditions in the whole of the silk-producing area in the northern provinces of Venetia and Lombardy were available it would be found that these provinces are more favourably placed than the rest of Italy for the production of raw silk. We have shown in the last chapter that the silk-producing industry in Italy is concentrated most in the northern

¹ The univoltine races are those races which give only one annual brood.

provinces. One of the reasons for this concentration is to be found in the greater suitability of the climatic conditions in the northern region. The figures for Venice only represent the climatic conditions prevailing in a limited area, but a knowledge of the distribution of the industry clearly shows that these conditions prevail all over the northern silk-producing area. The climatic conditions in the central area, as represented by the figures for Rome and Naples, are also suitable for the production of raw silk during the period June to September, though the mean maximum temperature in this area in July and August is higher than that in the northern area; but as it does not rise above 100° F., and also as the reading of the wet-bulb remains below 79° F., the cocoon crop is, as a rule, successful. It will be noticed that the climatic conditions in the central area are not very suitable for silk culture before June and after September owing to the higher humidity in the air. The figures relating to the climatic conditions in the southern area are not available at present, but probably they present features almost similar to those of the climatic conditions prevailing in the central area.

It is obvious from the analysis of the climatic conditions given above that the climate of a silk-producing country forms an important part of the economic environment. Its economic significance lies not only in the suitability of the conditions for the production of raw silk, but also in the length of the period during which the sericultural operations can be carried out successfully. The comparison shown in the last few pages embraces three countries only, but it is sufficiently interesting, as it indicates the fundamental requirements of the silk-producing industry in so far as the climatic conditions are concerned. In order to offer a general view of the climatic conditions in India, France and Italy, the figures in the tables are shown in the form of graphs which are added as an appendix to this volume. As the plotting of the monthly variation in temperature, humidity and the wet-bulb for the whole year involves unnecessary complications, only those periods¹ in which

¹ The conditions prevailing in the preceding and succeeding months are also shown so as to give completeness to the graphs.

the conditions are suitable for the production of silk are shown in the graphs. The size of each of the graphs indicates the length of the rearing season, and the variations in the climatic conditions during the season are shown by the curves representing temperature, humidity or the wet-bulb, and it is therefore possible to study the climatic conditions in the given areas at a glance. The areas selected for the graphs are represented by the following localities :—

Assam : Shillong, and Gauhati.

Bengal : Behrampore and Midnapore.

Kashmir : Srinagar.

The Deccan : Bangalore.

France : Montpellier, Toulon, Marseilles and Lyons.

Italy : Venice and Naples.

Where the climatic conditions are similar in two localities in the same country, it is needless to repeat them in the graphs.

So far we have discussed the first important factor in the economic environment necessary for the prosperity of the silk-producing industry. The other economic factors which we have stated already, also play their respective parts in the localisation of the silk-producing industry in a given area and must therefore be considered simultaneously with the climatic conditions.

THE MULBERRY AND THE OTHER ECONOMIC FACTORS

The suitability of the climatic conditions alone cannot accomplish the task of maintaining the life of the silk-producing industry in a country. Those races of the silk-worm from which the silk of commerce is obtained, are reared on the leaves of the mulberry trees, that is, in the preliminary stage of the silk-producing industry the mulberry forms an important raw material. A large supply of the mulberry trees is thus an important economic factor, which indicates not only the present location of the industry but also its future prosperity.

Another point of interest involved in this economic factor is the cost at which the leaves of the mulberry can be procured by the rearers. There is no doubt that in some cases

the agricultural classes undertaking the rearing operations possess a few mulberry trees in their private grounds and therefore do not need to buy their supply of leaves from other sources ; but, in most cases, the rearers either buy their supply in the market or receive it from the contractor who supervises the mulberry plantations. If the rearer possesses private mulberry trees the question of cost does not enter into the present discussion, but if he buys his supply of the leaves in the market, the question of cost attracts our attention. In a later chapter while determining the cost of production, we shall examine the influence of this item on the profits of the rearer, and also on his willingness to undertake silk culture, but here it must be remembered that the supply of the mulberry leaves should be procurable at a minimum cost in a silk-producing area. The cheapness of the supply, however, depends on the number of the mulberry trees available in the area and also on the transport charges, for in those silk-producing countries where the transport system is not developed, additional labour is required to carry the leaves from one locality to another, and therefore the price of the leaves is raised in proportion to the distances through which they are carried. From this point of view an easy access to the supply of the mulberry leaves is of great advantage to the rearing communities.

In all the silk-producing countries the mulberry tree either grows wild or is cultivated by the agricultural classes. In Kashmir, for instance, there is an abundance of natural mulberry trees that grow wild in the valley and are supposed to be indigenous. In addition to the natural stock there is a large nursery at Srinagar, where known species of the mulberry are kept for purposes of trans-plantation. The trees are brought from this nursery when three or four years old and planted in blocks 15 feet apart, on land near villages, so as to secure the maximum amount of attention from the cultivators. In Bengal the mulberry is grown chiefly in the form of bushes. This system is more suitable than the tree system for the areas producing many crops in the year, as it ensures a greater number of pluckings.

In France the mulberry is cultivated on a large scale in

all the principal silk-producing provinces. In the south, the province of Var presents a beautiful spectacle with countless mulberry trees all over the silk-producing area. In the Midi and in the other provinces where silk is produced the mulberry is cultivated on scientific lines, and there is always an abundant supply of leaves available for the rearers. In Italy the methods employed in the cultivation of the mulberry are somewhat similar to those employed in France, as in both the countries the young trees are first cultivated in the nurseries and then planted in suitable areas.

Among the other silk-producing countries in Europe, Austria and Spain have considerably developed their resources of mulberry in recent years. This development has resulted in an increase in the silk-producing capacities of these two countries and has greatly benefited the rearing communities. It is needless to dwell here on the vast supplies of mulberry available in China and Japan for the production of raw silk, as the predominant position of these two countries from a sericultural point of view is sufficient to indicate their industrial resources.

The next important factor in the economic environment conducive to the production of raw silk in any country is the supply of labour, which may be divided into two parts, the first supplying the requirements of the rearing branch of the silk industry, and the second supplying the needs of the reeling branch. Each of these parts possesses its own characteristics as regards efficiency, and performs functions which are necessary for the well-being of the silk-producing industry as a whole. These individual characteristics of the labour employed in the different branches of the silk-producing industry will be discussed in detail in the next section of this book, but it is necessary to point out here that, next to suitable climatic conditions and abundant supply of the mulberry, an adequate supply of cheap labour is an essential factor which determines the growth of the silk-producing industry. In some of the newly-developed countries where the wages are very high the production of silk on a commercial scale is practically impossible, as the product of a silk

industry built on high wages cannot compete with the product of the Japanese and Chinese silk-producing industries, unless remarkable mechanical appliances are introduced to reduce considerably the cost of production in other directions. It will be shown in one of the chapters in the next section that the problem of foreign competition as affecting the silk-producing industry, is governed chiefly by the comparatively cheap production of raw silk in Japan and China, and therefore all questions relating to the price of labour in the modern silk-producing countries are ultimately decided on the basis of the Far Eastern competition.

It may also be stated here that the agricultural communities play the most prominent part in the first stage of the silk-producing industry. As the rearing of the silkworms is generally a cottage ¹ industry, the agriculturists take up this occupation in order to increase their total income by utilising their personal efforts as well as those of their families. The reeling branch of the industry being entirely different from the rearing branch, attracts a different kind of labour. The reeling factories open a channel for useful employment of women and children, and in certain industrially backward countries the reeling industry offers great advantages to the otherwise unemployed population. But this is not the case in every silk-producing country. In France, for instance, the filatures sometimes lie idle owing to the diversion of the workers from the reeling industry to other more remunerative occupations, and the progress of the industry is greatly hampered. The supply of labour for the reeling industry should, as a rule, be regular, for if this condition is fulfilled, the other conditions regarding efficiency and output would be gradually fulfilled.

The last factor in the economic environment is related only to the reeling branch of the silk-producing industry, as the rearing branch does not stand in need of power supply. The reeling machinery requires power and the quality of the raw silk reeled depends to a large extent on the efficiency of the mechanical appliances used in the process of reeling.

¹ In some cases another system known as the "establishment system" is followed. We shall discuss the difference between this system and the "cottage industry" system in the next section.

This efficiency cannot be maintained if the supply of power is irregular ; and if the source of power is situated at a long distance from the reeling factory the cost of producing a unit quantity of silk rises in proportion to the unit increase in the cost of power supply. From the point of view of the reeling industry, therefore, the problem of power supply needs careful consideration and forms an important part of the economic environment necessary for the production of raw silk on a commercial scale. In the fourth chapter of the succeeding section we shall discuss this problem at length and show how some of the difficulties could be overcome by utilising the sources of power available in a given silk-producing area.

In the present section we have considered the suitability of climatic conditions, and have clearly shown the limits of temperature and humidity within which raw silk can be successfully produced in a country which possesses also the other suitable economic factors. It has also been shown that, in addition to the natural economic environment, the production of raw silk requires the help of human efforts in the form of an abundant supply of labour which satisfies the requirement of the different branches of the silk-producing industry. The problems involved in the last two economic factors have been stated briefly, and it is therefore important that they should be discussed more fully in the light of their individual characteristics. In order to understand the importance of these factors and to study their influence on production, in the next section, we shall first of all give an economic analysis of the silk-producing industry and then examine in detail the problems relating to the supply of labour, efficiency and organisation.

PART III

CHAPTER V

PRODUCTION

ECONOMIC ANALYSIS OF THE INDUSTRY

IN the previous section we have discussed the significance of the Economic Environment with special reference to the principal factors that render a particular locality suitable for the production of raw silk. In examining these factors, we have simply stated the outstanding features of the country that produces silk and have shown how far these factors operate upon the economic production of raw silk. This analysis is, however, incomplete so far as the internal economy of production is concerned. In order to make an economic analysis of the production of raw silk it is necessary to examine the different aspects of the industry and to see how specific economic laws operate in each; for each particular economic law has its bearing on some aspect of the industry and is ultimately related to production considered as a whole. There are individual instances where it is possible to find deviation from the normal course of operation, such as local peculiarities of labour; but in the long run the preliminary part of the silk industry must be governed by those economic laws that have a more or less similar effect on production in every country.

Before entering into a detailed economic analysis of the various factors of production, it is essential that we should draw distinct lines of demarcation between the three parts of the preliminary stage of the silk industry; as each part has a definite sphere of activity, and the labour conditions or rates of wages in one part cannot be transferred to the other. It may also be clearly stated that by production in this chapter we mean the production of raw silk which, after a series of operations, passes to the manufacturer for the

preparation of silk goods. As this initial thread is regarded as a raw material for manufacturing purposes it is important that its production should be treated as a basis of the entire silk industry. The most interesting feature of the industry is, that within the production of the raw material there are complete dependent wholes which are primarily related to one another and form distinct parts by themselves.

In the economic division of the industry the first important part is the production of the silkworms' eggs, technically known as the "seed." This branch of the silk-producing industry has a direct economic bearing on the second division which embraces the production of cocoons. The seed forms a raw material for the production of cocoons and is therefore an essential factor of production. On account of the advancement in scientific methods the production of the seed has become highly specialised. The progress is due mainly to the efforts of the sericulturists in France and Japan to secure an economic production of raw silk. As the output of cocoons depends very largely on the quality of the seed used, it is considered indispensable to obtain only that kind of seed which is absolutely free from disease.

In those countries where the silk industry is not so far advanced as to offer scope for seed production on a large scale, it is customary to import large quantities of seed from Italy, France or Japan. In France particularly and also in Italy, seed producing is an independent branch of sericulture and the business is conducted on a commercial scale. It is mostly confined to the southern districts of France. In the province of Var there are "graineurs" or seed-producers, who export large quantities of the seed to all parts of the world.

In Kashmir, formerly, the practice was to import the seed from France and Italy. This practice continued for a number of years and the results obtained from the foreign seed were supposed to be quite satisfactory; but five years ago it was decided to try the "local seed," that is, the seed reproduced within the country. Fortunately the experiment proved a partial success during the first year and its repe-

tition was considered desirable. At present a good deal of the "local seed" is used in Kashmir and a part is sent to other parts of India for trial purposes.

Here it is advisable to examine the economic importance of the "local seed," that is, the seed produced within the country producing raw silk. From an industrial point of view the subject of seed production is directly related to cocoon production, and it is therefore evident that those factors which tend to reduce the supply of the seed must be taken into consideration when dealing with the production of cocoons. If, under given climatic conditions, it is possible to produce the commercially ideal quality of the seed within the country, the problem of industrial development, in so far as the silk industry is concerned, will be greatly simplified. There are, however, other important reasons which must be considered before coming to a definite conclusion in regard to the production of the local seed.

First of all it is obvious that the importation of the seed involves dependence on a foreign country for a regular supply of the raw material, and is, therefore, subject to transport delays, which have been very often experienced by the importers during the present war. This delay does not only hinder the progress of the industry, but puts out of action the labour force employed in it, and causes an industrial depression which directly affects the economic welfare of the agricultural classes, and indirectly reduces the total national dividend of the country, especially when the silk industry is the backbone of the industrial structure, and when there is a sudden disappearance of an important item of contribution. In addition to the difficulties of transportation there is a danger of total prohibition in some cases, especially in abnormal times when a particular state may regard the exportation of the seed as unnecessary. Such examples are rare, but due allowance must be made for extreme measures. Before the war it was inconceivable that any seed-producing country would prohibit the export of the seed or of the silk-worms, but the contingent measures adopted during the war have proved that such an action is possible. A recent instance of prohibition of this nature is afforded by the Luog

Decree by which silkworms are added to the list of export prohibitions.¹ This is, of course, a matter of minor importance, as other channels through which the seed can be imported are still open. But by developing the argument into its ultimate form and by assuming that the silk-producing country depending on a foreign seed supply is completely cut off from the various sources of supply, we can easily appreciate the advisability of producing seed within the country.

The second argument against the importation of the foreign seed is directly related to the "Cost of Production." In a later chapter we shall explain the term "Cost of Production" with special reference to the production of raw silk, but here it will be sufficient to indicate that the cost of producing a definite quantity of raw silk includes the price paid for the silkworms' eggs, and therefore that part of the circulating capital which is invested in the purchase of the raw material is an important item of the net cost. If other items remain constant, an increase in the price of the seed causes a proportional increase in the cost of production of the raw silk, and thus leaves a proportionally smaller margin of profit to the producer.

Let us take an example to illustrate the effect of foreign seed supply on the cost of production. In Kashmir, the silk industry is controlled by the State, and it is estimated that the State at present produces seed at a very little over 1s. 4d. per oz. The price paid for the imported seed is nearly 4s. per oz.² If the total amount of the seed used in a year is on the average, about 40,000 ozs., the capital invested in the purchase of the raw material from a foreign country amounts to £8,000. If, during the same year, the labour charges amount to £30,000, the ratio between these two items of the cost of production is only 1 to 3½. The

¹ "Il Sole," March 14th, 1918. The *Rome Official Gazette* publishes the above Decree.

Exportation of the seed or "graines" in boxes from Japan commenced in 1860, though till 1865 it must have been carried on secretly, as a law existed till then which prohibited the exportation of the seed under penalty of death. See "Industries of Japan," by J. J. Rein, 1889, p. 202.

² Lefroy, "The Silk Industry in India," 1916, p. 50.

difference between the labour charges and charges for the raw material becomes less as the price of the seed rises. On the other hand, the lower price of the seed grown in Kashmir (which is only one-third of the price paid for the foreign seed) causes a proportionate reduction in the charges for the raw material and thereby leaves a larger margin of profit to the State in the long run.

It is sometimes argued that a well-fitted establishment for the reproduction of the seed means a great financial burden to the silk-producing country, but the fact that such an establishment more than repays its expenses after a number of years when seed production gains a firm footing, is completely ignored.

A third advantage of local seed production is the establishment of another subsidiary industry. From an economic point of view the formation of a subsidiary industry is of great importance, as it involves the utilisation of the skilled as well as the semi-skilled stock of labour available in the producing country. Taking the case of the Indian silk industry into consideration we find that, under favourable conditions, seed production would offer attractive openings to that part of the educated classes which takes active interest in the industrial development of the country. Above all, if the promoters of the Indian silk industry desire to organise it on a commercial scale, the resources of Kashmir in seed could be easily utilised without depending on the mercy of foreign "graineurs," and the home industry could be made practically self-sufficient.

Leaving the purely economic considerations aside for a moment, we may review the position from a sericultural point of view. The technical details of sericulture do not concern us here, but as the production of raw silk is governed mainly by suitable climatic conditions, it is possible to hazard an opinion on the subject of seed production, which may lead to the elucidation of points discussed above. The quality of the initial thread of raw silk depends on the quality of the cocoons from which it has been reeled off, and the quality of these cocoons depends on the seed used for their production. It is obvious, therefore, that the quality of the raw

silk is to a great extent determined by the quality and the kind of the seed employed. In actual practice it has been found that the silkworms' eggs are very sensitive to climatic changes, and it is therefore essential that after a choice of variety and race has been made, the seed should be produced locally so as to allow a particular species to become acclimatised and develop under local climatic conditions. This procedure is still more important in those countries where an indigenous race of the silkworm has been discovered.¹ In the case of Kashmir, it has been declared by an eminent authority on raw silk that the first few bales of silk imported into this country contained a better quality of thread than that obtained from later shipments. It is held that the early shipments contained raw silk produced from the indigenous seed. Following the line of argument indicated by the suitability of climatic conditions, we are justified in assuming that the indigenous seed having been acclimatised in Kashmir for centuries, gives a better quality of thread than the product of the imported seed. But the final decision as to the relative values of the imported seed and the indigenous seed can only be given by an entomologist.

After having examined the arguments given above the position may be summed up as follows : the local reproduction either from the acclimatised imported eggs or from the indigenous seed is highly beneficial to the industry as a whole, provided due attention is paid to the sericultural essentials involved in the methods of reproduction.

Resuming the economic analysis of production, we find that the next important branch of the raw silk-producing industry is the production of cocoons. Comparatively speaking, the production of cocoons does not involve industrial complications, and for this reason, some countries prefer to go only as far as this stage. For instance, before the war large quantities of cocoons were regularly exported from the Levant and the Caucasus to Italy. In other countries, such as China, Japan, Kashmir, and some parts of India, when the

¹ Professor Lefroy mentions a distinct race which was found indigenous in Kashmir, and is now no longer grown. See Lefroy "The Silk Industry in India," Vol. I., p. 90.

output of cocoons is in excess of local requirements, the surplus is exported to France and Italy. Of late years there has been a shortage of cocoons in the European countries, and in order to keep the machinery in the reeling establishments going, it has been necessary to import cocoons from the Asiatic sources.

From a purely commercial point of view the production of cocoons may be regarded as an independent branch of the silk industry. There is always a demand and a good market for cocoons in those countries where, owing to unfavourable economic conditions, the production of cocoons has declined. The main point of economic interest, however, lies in the fact that the cocoons form a raw material for the reeling factories, and therefore the output of raw silk is governed by the quantities of cocoons available in the market at a particular period, and by the stocks within the reach of the reelers.

So far we have dealt with the first two economic divisions of the raw silk-producing industry from an analytical point of view. We shall now determine the exact nature of these divisions and ascertain the manner in which they are related to agriculture in general. The determination of this relation is important for two reasons. In the first place, the sericultural problems are closely related to the agricultural problems and the solution of any problem in either group clears the way for both. In the second place, a distinct analogy between these two industries explains their individual economic features. We shall, therefore, examine the general economic characteristics of these industries in order to discover points of similarity.

The first important feature that attracts our attention is the simplicity of operations in the production of cocoons. This is clearly illustrated by the fact that a large percentage of the labour employed in this branch of the silk industry is agricultural, mainly composed of peasants and other workers who take part in the production of agricultural crops and, who, owing to their inherent qualities, acquire the extra amount of efficiency required for rearing the silkworms in a comparatively short time. Although there is no apparent similarity between the production of rice or wheat and the

production of cocoons, yet the underlying principles are practically the same in agriculture and sericulture. For instance, we have the seasonal production of crops working on similar principles in these two industries. Some races of the silkworm give only one crop or "brood" (as it is technically known) during the year. These races are known as the "univoltine" races by the sericulturists; others give more than one crop ("many-brooded races") and are known as the "multivoltine" races. The production of cocoons from any of these races is subject to seasonal changes, and the process of "repetition" in the many-brooded races is regulated by the period of the year during which the climatic conditions permit breeding of the silkworm. The "repetition" of crops, therefore, shows two fundamental characteristics; firstly, that of a definite period of the year, and secondly, that of suitable climatic conditions. In these two respects the general analogy between sericulture and agriculture is complete.

The second element of comparison rests on the utilisation of the mulberry for purposes of feeding the silkworm. The cultivation of the mulberry is in itself an agricultural process and therefore does not require any differentiation. Here agriculture is not only analogous to sericulture, but is an important part of the structure which supports the raw silk-producing industry. As the mulberry leaves are used for feeding the silkworm, the output of cocoons is determined by the quantity of mulberry leaves available in the producing area if other conditions are normal.

Next we come to the very important problem of crop returns in the agricultural industry. In order to explain the subject in a lucid form and to see if the theory of crop returns applies to silk culture in a similar way as to the production of wheat or rice or any other agricultural crop, it is necessary to refer to the well-known "Law of Diminishing Returns." According to this "law," a tendency to diminishing returns is observed in the case of a particular tract of land, and obviously a limit is placed to its productivity. When the maximum limit is reached a deviation from the continual rise of the curve is observed and after that

limit, the crop returns of that specified area do not increase in proportion to the extra amount of capital and labour expended on its cultivation. Take, for instance, the example of wheat. The crop return in bushels per acre may continue to rise for some time, but after the maximum point is reached any further doses of capital and labour yield proportionately less return than the return to the preceding doses.

In considering this "law" it is important to keep the preliminary assumption in view, which states that during the period of production there is no change in the arts of cultivation.¹ If, however, there are changes, as under the present agricultural conditions when every nation is striving hard to increase the productive capacity of land, then the application of the "law" is suspended and the crop returns exceed the pre-supposed maximum limit. In recent years, the discovery of new manures and the fixation of atmospheric nitrogen have completely overruled the previous assumption. There is no doubt that ultimately a limit might be reached beyond which it would be impossible to obtain proportionately greater returns to progressive doses of capital and labour, but it is extremely difficult to determine that ultimate limit.

Passing from the particular case of land to general industrial returns the "law" states "that the increment of product, due to the increase, by a unit, of any factor of production in any industrial field, will, in general, be smaller, other things remaining the same, the greater is the supply of that factor already employed there."²

In the above statement, the application of "Diminishing Returns" is extended to any industrial field and the increment of product is related to an increase in any factor of production. The point at issue, however, is to ascertain whether the "Law of Diminishing Returns"³ is applicable to the production of cocoons. The problem, therefore, resolves itself into two parts: (1) does any analogy exist between crop returns from agriculture and crop returns from

¹ See Marshall, "Principles of Economics," Vol. I., 5th edition, pp. 150, 154.

² Pigou, "Wealth and Welfare," p. 80.

³ This law may be expressed as a "tendency."

sericulture? (2) if the answer to the first part is in the affirmative, what is the limiting factor and how does it affect the production of cocoons?

As regards the first part of the problem the solution may be regarded as purely empirical. The theory is based, firstly, on the conception of a close analogy between agriculture and sericulture, and secondly, on the results of experience. For purposes of an accurate economic analysis, the figures relating to the production of cocoons as given in various annual reports cannot be relied on. The difficulty arises in the exact measurement of the progressive doses of labour. It may be observed that as the industry expands and the duration becomes longer, the efficiency of the *unit* dose of labour does not remain constant, and therefore the number of rearers in two different periods does not represent a definite number of doses of labour. Thus, for instance, in the early years of the silk industry the efficiency of the rearers in Kashmir was far below the present standard. With the gradual development of the industry the productive capacity of the unit dose of labour became greater and greater.

It will be seen from the above remarks that if the crop returns of cocoons in relation to the number of rearers employed during a particular year were taken as a basis of the present argument, the final result would be mathematically inaccurate, and the variations in the curve relating to production would be misleading. It is therefore essential to carry out experiments under definite climatic conditions with rearers of a given efficiency and with a standard quality of the seed, so that "other things" may remain the same in all cases.¹ In the absence of statistics of this nature, it is difficult to say how far "Diminishing Returns" can be applied quantitatively to the production of cocoons.

It is generally believed by the sericulturists that the returns from cocoon crops and also the returns of raw silk move within a fixed limit. A very interesting statement is

¹ This difficulty could also be removed by changing the unit of labour. For instance, if the efficiency increases, the number of units of labour required to rear the same quantity of eggs could be decreased, provided the proportionate increase in the former is known.

given by the writer of a little book ¹ on silk culture, published in 1826. "Wishing to know," he states, "what was judged to be a reasonable return in silk from an ounce of eggs, I took the opportunity of putting the question to a gentleman of great practice in this culture. His answer was, that he reckoned himself very well off when he had at the rate of five pounds of silk from an ounce of eggs; though he said he had sometimes got six, seven, eight and even nine pounds per ounce; nay, he had known others get as much as ten pounds per ounce. But he repeated that he thought a man had full reason to be satisfied with five pounds of silk per ounce, more especially if his quantity of worms were large, *as the larger the quantity of worms, the return of silk must, of course, be less in proportion*, as it was utterly impossible to pay the same just and accurate attention to the culture of a very large number, that can certainly be given to a smaller quantity."

It appears from the observations of the writer that he intended to express the views of the experienced sericulturist in the form of "Diminishing Returns," but it is not clear how the conclusion has been drawn. Probably the limiting factor is determined by the relation of the quantity of labour to the quantity of the seed issued for rearing purposes, that is to say, after a certain limit, the contribution of the given quantity of labour to the output of cocoons is less in proportion to the quantity of the seed issued. Although there is no direct evidence of cocoon returns, there is an indication which suggests the applicability of "Diminishing Returns." We may, therefore, regard the application of the "law" as certain.

The next important point in this discussion is to ascertain whether there is any other limiting factor besides the one which we have touched upon in the last paragraph. In so far as the principal factors in production are concerned, the only remaining factor which may influence the cocoon returns is the quantity of the mulberry leaves available in a particular area. It is possible that in this factor also we

¹ "Observations on the Culture of Silk," by Arch. Stephenson, Esq.

may find the required condition, that is, the condition which expresses the tendency of "Diminishing Returns" in the production of cocoons.

The cultivation of the mulberry is an agricultural operation. The yield of leaf per acre of mulberry land varies according to the soil, the water supply, the manure and the number of pluckings.¹ But, as a rule, there is a limit to the yield, and after a certain point it would be impossible to obtain a proportionately greater return to the progressive doses of capital and labour, provided there are no changes in the arts of cultivating the mulberry. In the first place, the number of pluckings determines the limiting point, after which the additional doses of capital and labour will obtain a proportionately smaller return than the preceding doses, and in the second place, a given tract of land can grow only a definite number of trees so as to yield the maximum quantity of leaf. Under these conditions, the cultivation of the mulberry follows "Diminishing Returns," and as the output of cocoons is governed by the quantity of food (mulberry) available for the silkworms, it may be concluded that the production of cocoons follows a similar tendency. In order to confirm the theory, the limiting factor is therefore to be discovered in the mulberry. Professor Lefroy, in his treatment of the Kashmir silk industry, observes that the cocoon-producing industry has nearly reached the limit of the available trees.² At this stage, an additional investment of capital or employment of extra labour will not result in a proportionate increase in the output of cocoons.

In attempting to find an analogy between agriculture and sericulture we have noticed that in the preliminary part of the silk industry there is a gradual movement from agriculture to the production of raw silk, and that the removal of any of the principal impediments to this movement not only increases the output of raw silk by increasing the quantity of labour

¹ Lefroy. "The Silk Industry in India," Vol. I., p. 87. Professor Lefroy quotes Maillat and Lambert, who give the yield of a seven years old tree in France as 5 maunds (410 lbs.); the trees grown 20 to 30 feet apart, give from 250 to 360 maunds (20,500 lbs. to 29,520 lbs.) per acre in one plucking over the two months rearing season.

² "The Silk Industry in India," Vol. I., p. 50.

engaged in the production of cocoons, but also contributes to the economic welfare of the agriculturists. Another point of great importance that has appeared incidentally in the course of the quantitative analysis, is the part played by Nature in production. Spontaneous variations in the volume of the output arise out of variations in the bounty of Nature in a particular country, other things remaining the same. The wonders of mechanical science have largely contributed to production and have minimised the misery and want due to the malevolent forces of Nature in certain agricultural crops by irrigation, mechanical ploughing, artificial manures, and other devices ; but in the production of raw silk, we have, to a large extent to depend on the bounty of Nature, or else the cost of production rises in such a way as to make prices prohibitive in the world market. The uncertainty of human agency operates in a similar way both in agriculture and sericulture, the only difference being that in the former there is a greater scope for the application of artificial methods than in the latter.

The movement above referred to leads us to a consideration of the final stage of the raw silk-producing industry, that is, the production of raw silk from the cocoons. This is the reeling branch of the industry and, being entirely different from the previous branches, follows different economic laws. In the first place, there is a transition from the cottage industry system to the factory system, and secondly, reeling stands on the border line between the production of the raw material and the manufacturing industry. In France, Italy, Kashmir, Japan and some parts of China, reeling is conducted on most modern lines in well-equipped reeling establishments, known as the filatures, and is no longer related to the agricultural industry. There are some places in India and China, however, where indigenous methods (which are more or less primitive) are still followed, but the raw silk produced in this way is either consumed locally or sent to the filatures for re-reeling purposes.

It has been pointed out in a previous paragraph in this chapter that the production of cocoons in France is in a progressive decline. This presents an alarming situation

to those who are managing the filatures and are responsible for the annual output of raw silk. Various methods have been adopted to check the progress of this decline, and at present it is difficult to say which of these methods will prove efficient. One of these methods is the importation of foreign cocoons.¹ This might have produced satisfactory results, but owing to the war supplies, from the near East and Central Asia ceased to reach France and a part of the plant in the filatures had to lie idle again. It has, therefore, been considered necessary to discover new sources for the supply of cocoons so as to preserve the future interests of the reeling industry.

The above problem presents two alternatives, and in order to judge their economic values we have to consider them separately. The first is the exportation of the surplus of cocoons from a raw silk-producing country where such a surplus exists. This is undoubtedly a sound method of disposing of a surplus of any commodity and is, therefore, very useful from an economic point of view, as it involves the commercial utilisation of that part of the commodity under review which exceeds the demand of the home market. Under proper transport conditions, surplus of this nature must find an outlet, and if there is a sure market for it in another silk-producing country the result is an economic gain to both the countries. The following passage from Adam Smith's "Wealth of Nations" explains the necessity of exporting the surplus produce: "When the produce of any particular branch of industry exceeds what the demand of the country requires, the surplus must be sent abroad and exchanged for something for which there is a demand at home. Without such exportation a part of the productive labour of the country must cease, and the value of its annual produce diminish. The land and labour of Great Britain produce generally more corn, woollens and hardware than the demand of the home market requires. The surplus part of them, therefore, must be sent abroad and exchanged for something for which there is a demand at home. It is only by means of such exportation that this surplus can acquire

¹ See the author's "The Silk Industry and Trade," p. 89.

a value sufficient to compensate the labour and expense of producing it." ¹

The second alternative is that of fixing a limit to the extent of production. This method involves the suggestion that certain countries should confine their activities to the production of cocoons only. Various arguments have been given in support of this suggestion by the French reelers. The chief points may be summed up as follows:—(1) the production of cocoons requires less capital than the production of raw silk in a filature; (2) less efficiency is required to produce cocoons; (3) results achieved are visible sooner in the case of cocoons than in the case of raw silk; (4) profits realised come home to the producer sooner and perhaps more in the case of cocoons than in the case of raw silk; (5) there are fewer complications in the management and production of cocoons than in the filatures; (6) a market for cocoons is almost sure, specially at present, and after the war when there will be a scarcity of cocoons.

The arguments given above are applicable only to new areas of production. It is true that when an industry is in its infancy, there should be a minimum multiplicity of operations and each stage should be developed in its turn, specially when each forms a part by itself and can make the industry realise its profits. But when we take those areas into consideration where silk is already produced, the hidden discrepancies of the suggested method become evident.

The first great disadvantage of mere cocoon production is the absence of self-sufficiency in the silk-producing industry. The element of dependence on foreign reelers for the utilisation of the product makes cocoon-production a merely subsidiary operation, and renders the commercial exploitation of the country concerned easier and more direct. The spirit of industrial independence becomes limited and the producers become mere instruments of supply of the raw material for a foreign market.

Another grave disadvantage of mere cocoon-production is the limited field for the employment of labour. In a cocoon-

¹ Book II., chap. V., quoted by Professor Nicholson in "A Project of Empire," p. 66 (1909 edition).

producing country only the peasants and the agricultural classes can take part in production. On the other hand, the filatures afford employment to labour in general and can make the industry a complete whole. Moreover, there is an extension of the industrial system, as the larger the extent of the silk industry the greater is the number of sister industries connected with it.

There is yet another aspect of this problem which involves questions relating to the home and foreign trades. The significance of this aspect will be seen best by examining a concrete case, say that of the Indian exporter of cocoons. It is evident that the sale of raw silk in France, for instance, gives a larger monetary return to the Indian exporter than the sale of cocoons, and enables him to reinvest the capital in the further development of the industry. If the raw silk is reeled in India the difference between the money values of these two commodities is represented by the amount of labour and capital expended within the country, and is ultimately paid by the importer. If, on the other hand, cocoons are exported, the cost of reeling which includes the wages of the worker and establishment charges, are paid by the importer to his own reelers and for the interests of his own country. In one case there is an increase in the national dividend ¹ of India, in the other there is a proportionate loss which is a source of income for the importing country. It is therefore obvious that in this case there is a greater advantage in the home trade than in the foreign trade of cocoons, as the raw produce is utilised within the country and the employment of capital gives greater encouragement to the productive labour of the silk-producing country. The argument may be extended further for general application to show that "the greatest national advantage is obtained by the employment of the capital in the home trade," ² but for our purposes it will be sufficient to indicate that the system of mere cocoon production in a country

¹ An increase in the national dividend of India would result from the profitable employment of "miscellaneous labour," that is, the labour which is either unemployed or employed in less remunerative occupations.

² See "A Project of Empire," by Professor J. S. Nicholson, p. 49

where raw silk can be produced is detrimental to the future development of the industry. Not only does it hamper the progress of the home trade, but it also stimulates a desire on the part of the foreign reelers to widen the scope of exploitation.

In addition to the disadvantages of mere cocoon-production discussed above, the question of supplying the home demand brings out another drawback of this method. If a country like India were to produce cocoons only, she would have to import raw silk from other countries to meet the demand of the home market, and instead of developing the home trade she would be encouraging the foreign trade in a commodity which could have been produced more economically within the country. Judged from an economic standpoint, therefore, the capital employed in the foreign trade performs functions which benefit a foreign country more than the home country, and makes the demand for raw silk in the home market dependent on foreign supply.

The arguments in favour of making the silk-producing industry self-sufficient show the importance of the reeling branch of the industry. On a general review of the situation, we find that the three branches of the industry are related to each other in such a way that the welfare of one part depends on the prosperity of the other, and the greatest economic advantage is secured by a harmonious working of the three parts.

So far we have considered each branch of the silk-producing industry as an independent stage in the life history of silk production, and for purposes of economic analysis we have discovered the connecting links between the various stages. In the next chapter we shall examine the requirements of the industry in so far as labour and efficiency are concerned.

CHAPTER VI

LABOUR AND EFFICIENCY

THE economic analysis of the silk-producing industry, as given in the preceding chapter, clearly shows that the various branches cannot be treated in conjunction with each other. There is no doubt that the labour force for the first two branches is derived largely from the agricultural communities in silk-producing countries, but that does not signify that the employment of labour is confined entirely to agricultural classes. Moreover, the problem of efficiency, as applied to agriculture, requires careful consideration before it is applied to cocoon production. The participation of the agricultural classes in rearing and cocoon producing is undoubtedly facilitated by a partial similarity in the two occupations, but this similarity does not explain the principles relating to the quality of efficiency required in the silk industry.

Strictly speaking, the sericultural labour cannot be regarded as exclusive, as the period of reproduction¹ generally lasts for about forty days every year, in the case of a "univoltine" race. When the race is "multivoltine" the rearing activity is repeated three or four times during the year and, therefore, the rearers are employed more than once according to the number of broods. A particular case of the latter type is the Bengal silk industry, in which the repetition of rearing is illustrated by the principal crops in November-December, February-March-April.² In Kashmir, France and Italy, only one cocoon crop is obtained during the year. The presence of a system of obtaining one brood annually explains the necessity of employing agricultural labour, so as to enable the workers to devote their energies to agricultural crops

¹ *I.e.*, the period required for rearing the silkworms for purposes of cocoon production.

² See Lefroy, "The Silk Industry in India," Vol. I., p. 17.

(such as rice, wheat, barley, etc.) after the cocoon crop is finished.

Another feature of the employment of agricultural labour in the silk-producing industry is the effect of "joint contribution" on production. Generally four or five members of a family participate in the production of cocoons, with the result that this united labour force increases the output of the produce and, in most cases, allows the head of the family to take part in other agricultural occupations. This system of united labour or "joint contribution" is more or less universal in silk-producing countries and includes the employment of women and children on comparatively lighter work. Its great advantage, from an economic point of view, lies in the utilisation of any surplus dose of labour in the family, and also in the formation of a family labour organisation.

Before proceeding further, it may be noted here that the labour situation is somewhat different in the case of seed production. In this branch of the industry the quality of the labour employed is determined by the skill acquired by specialisation. The majority of rearers receive the seed from various establishments which are conducted by professional "graineurs," who specialise in the scientific methods of production and produce seed on a commercial scale. The efficiency of labour employed in this branch of the industry is therefore the result of scientific training and specialisation, and may thus be excluded from the agricultural labour in general.

In continuation of our former inquiry regarding the employment of agricultural labour, a point of great economic interest arises at this stage. This point deals mainly with the system on which labour is employed in the cocoon-producing industry. The system described above admits of the formation of a family labour organisation and is known as the "cottage industry" system, as opposed to the "establishment" system. The latter represents one particular aspect of the industry and is characteristic of the big sericultural establishments in the Cévennes and the Midi (France). The proprietors of these establishments play the part of the head of a family in the "cottage industry"

system, and employ labour of a varying character. The *personnel* consists mainly of women and girl workers. As a rule the labour force is recruited from the adjoining agricultural communities, and the workers are required to live within the premises of the establishment. The workers are generally employed during the cocoon harvest season, after which they leave the establishment and go back to their homes.

The problem that arises out of a consideration of these two systems is twofold. In the first place, it deals with the interests of the employees and the consequences of the form of employment on the future prospects of the industry. Secondly, it deals with the effects of the methods of employment of labour on the output of cocoons. The question as to which of these two systems is more economical in the long run can only be answered by examining their relative values.

The primary consideration is more of an ethical than of a purely economic nature. The *primâ facie* evidence, in this respect, is in favour of the "cottage industry" system. There is no doubt that this system affords many opportunities for individual development, and freedom is its keynote. The worker produces cocoons in his humble cottage, among homely environments and feels free from external obligations. He is not tied down to any limitations or restrictions that are, as a rule, binding on workers in most of the establishments. In addition to cocoon production he is in a position to devote his spare time to other agricultural pursuits, and is thus able to add to his earnings in various ways. He is full of the spirit of self-reliance and realises that his labour is that of an independent working man.

In the "establishment" system, on the other hand, conditions are entirely different. The labourer is regarded as a mere human instrument of production and is governed more or less by arbitrary laws. There is no freedom of action, the employers are masters and the workers are servants. There is no choice between occupations and the worker is faced with restrictions of all kinds at every step.

Again, the relative merit of the "cottage industry" system goes further in touching upon the moral side of the question. Under this system the family is guided by a

father, is looked after by a mother, and the discipline is conducted on the basis of family life. But in the "establishment" system, where large numbers of young girls and men are given housing facilities within the same premises, moral responsibilities are not always placed in the first rank and, apart from the organisation within the establishment for the interests of the employers, there are no other forces to keep the moral discipline intact. It is extremely difficult to frame regulations which would apply both to work and to spare time. This kind of moral danger has been pointed out in the case of the French cocoon-producing industry by M. Beauquis,¹ who maintains that the "establishment" system is liable to moral laxity on the part of the workers. It is obvious, from the ethical point of view, that the "cottage industry" system is highly beneficial to the workers in so far as moral realisation and freedom are concerned, and therefore the continuance of this system in all silk-producing countries is desirable for the future prosperity of the industry.

The next point that draws our attention in this discussion is the effect of these two systems on the ultimate output of cocoons. As the ultimate annual output is made up of individual units of production, the problem may be considered from the point of view of the individual unit of labour. A general study of the human nature shows that under normal conditions of production the intensity of desire for work is simply proportional to the rate of remuneration, and if a definite unit of labour produces more of a certain commodity than another unit of the same class, the increase in the output of the former unit is due mainly to a greater desire for better remuneration. This kind of desire which prompts action, is to be found more under conditions of freedom than under restrictions. The idea of central control in a cocoon-producing establishment suggests that the workers perform their duties as a matter of course, and do not devote their energies to increasing the output in the same way as they would have done if they were working on their own account. Thus Sigdwick, while considering the effects of the employment of labour under one management on produce, in his

¹ "Histoire Économique de la Soie," par A. Beauquis, 1910, p. 50.

time in England, points out that "the greater part of the labour purchased by employers is sold for a price simply proportioned to its time; so that the labourer has not nearly so strong a motive for exerting energy, skill and care as he would have if he were working on his own account."¹ It is possible, no doubt, to prevent diminution in the output by watchful supervision, but a great deal depends on the nature of the industry. In the cocoon-producing industry the interests of the agriculturists are diametrically opposite to those of their employers under the "establishment" system, and it is therefore obvious that the hired supervision is liable to inefficiency. On the other hand, the necessary supervision changes into a form of family discipline in the "cottage industry" system, with the result that each member contributes to the output of cocoons according to his or her productive capacities, so that in the long run the family adopts a system of internal labour organisation with a natural spirit of freedom and with a hearty desire for producing more.

Above all, the psychological element plays an active part in the choice of an occupation. The attractions of agricultural life soon abandon the rearer when he accepts employment in a cocoon-producing establishment, and the "will to work" receives a sudden shock in a completely different environment. This psychological change has, undoubtedly, an adverse effect on his productive capacities and consequently the net result of his labour suffers in a similar way.

Judged in the light of the arguments given above, the "cottage industry" system seems to be more suitable to the cocoon-producing industry than the "establishment" system. The problem involves both the ethical and the economic aspects, and it is therefore essential that the subject should be treated as one which determines not only the future prosperity of the silk industry, but also the moral and economic welfare of the agricultural workers employed in the production of cocoons.

The employment of labour assumes a different form when

¹ "The Principles of Political Economy," Sidgwick, p. 115 (1901 edition).

the silk-producing industry passes from cocoons to the reeling stage. This brings us to a consideration of the factory conditions. The nature of the reeling industry suggests that the type of the labour required in this branch is distinctly different from that required for cocoon production. The institution of the modern filatures, that is the reeling factories, demands a more or less continuous supply of labour in favourable times. The quality of the labour required is necessarily such as would attract not only those persons who are accustomed to the manipulation of the delicate textile fibres, but also those who come within the surplus stock of labour, and who can acquire the desired efficiency with sufficient ease after a short preliminary training.

A point of common interest is the relation between the output of raw silk and the supply of labour in the filatures. In some cases there are periodical fluctuations in the supply of cocoons for the reelers, and consequently there are variations in the output of raw silk, so that a fall in the latter is due to a fall in the former. If the supply of labour becomes scarce when there is a rise in the supply of cocoons, the output of raw silk in the filatures suffers as if there were a scarcity in the supply of cocoons. In the long run, therefore, a scarcity in cocoons and a scarcity in the labour supply react in a similar manner on the output of raw silk. Events of this kind often happen in France, sometimes on account of the labour difficulties, and at other times owing to a shortage of cocoons.

It may be observed here, that the labour employed in the filatures is composed of boys, girls and elderly women, and thus forms a part of the surplus stock which is generally available in most of the silk-producing countries. For instance, in Srinagar (Kashmir) the reeling industry offers employment to a fairly large part of the surplus labour which would have been otherwise either unemployed or employed in something less productive than the silk industry.¹ Similarly, in Marseilles, the labour is recruited partly from

¹ The surplus stock of labour includes certain unnecessary domestic servants, and also men and women employed on barges kept merely for purposes of sport and luxury.

the suburban areas and partly from the neighbouring small towns. In recent years especially, the labour force for the filatures in France and Italy has been derived mainly from the class described above. The utilisation of the surplus stock (including women and children) was necessitated by the exigencies of military requirements, and in this way every available unit of the national labour force was put into the industrial field in these two countries. Thus in the European countries the surplus stock of labour does not exist any longer and, after the war, when the period of industrial transition comes, the filatures will be forced to raise the wages to such an extent as to attract labour to this industry. The question whether the filatures would adopt new measures will be discussed in another chapter, but it is necessary to indicate here that both in France and in Italy the fate of the reeling industry will depend, to a large extent, on the post-war organisation of labour.

Reviewing the situation as a whole in the raw silk-producing industry, we find that the agricultural labour plays a significant part in the economic march of the industry. In fact, for purposes of generalisation, one may say that every fresh impetus given to the production of cocoons can always be measured by the efforts of the agricultural communities without whom the position would assume a serious aspect. But as the tendency of the agricultural workers is, in the majority of cases, to exert their energies in more than one direction in order to increase their share of the national dividend, progress in the production of raw silk depends on the absence of external impediments, such as the reaction of other industries.

After having considered the general economic principles on which the labour supply is organised, the next important problem in the present discussion is to ascertain the manner in which *efficiency* determines the productiveness of labour and brings about variations in the average annual produce in different countries. In comparing the annual output of cocoons, we are naturally inclined to ask—what are the causes that make the average annual produce per head of an agricultural community, in a given country, greater than in

another? The question is stated in general terms and involves more than one factor. First of all, we have the differences in the productiveness of labour due either to the "spontaneous bounties of Nature" or to the favourable circumstances, and secondly, there are differences created materially by variations in the primary wants of the rearers in different countries. The differences due to these two causes may be set aside for the present, as it is intended to find the source of variation in the efficiency of labour.

In every industry the prosperity of production is governed by the qualities and the special adaptabilities of the working classes. The difference in the qualities of the workers of two competing countries implies a difference in the standards of efficiency, and it is therefore efficiency that determines the relative values of production when other factors are assumed to be equal.

It may be observed that the term *efficiency* as applied to the production of cocoons or of raw silk, refers not only to collective production but to individual production as well. But as the former is composed of a large number of units of the latter, the solution of the entire problem can be easily obtained by a reflective analysis of the individual efficiency. Here the problem resolves itself into two parts, (1) what causes variations in the efficiency of the rearers in different countries, and (2) how can these variations be measured?

In solving the first part of the problem it is necessary to refer back to the source of labour. The labour force, as we have already seen, is derived mainly from the agricultural classes who exhibit variations in their productive capacities. As a matter of fact, in some countries the standard of efficiency varies with individual families. This variation is due chiefly to tendencies transmitted through physical heredity and in some cases can be traced back to three or four generations. In China, the rearers possess an instinctive skill, which is undoubtedly the result of hereditary transmission of those qualities which the previous generations acquired after a long training. There is a certain amount of originality in the efficiency shown by the present generation of the rearers in Kashmir, for instance, but the influence

of heredity makes its appearance soon after the first three or four years have passed. It cannot be denied, therefore, that "the productive qualities of man, no less than those of plants and animals, exhibit differences that are, relatively speaking, original—that is, of which the origin is lost in prehistoric obscurity; and at the same time they are similarly susceptible of improvements that may be transmitted through physical heredity."¹ In the case of the Kashmir silk industry, it was observed that even after a long period of decay the new rearers soon acquired the necessary skill in the rearing and breeding operations. Perhaps it was due to the fact that most of the families who took up the cocoon-producing industry inherited the particular tendencies, and thus overcame the preliminary difficulties which the entirely new families would have taken much longer time to overcome. The French rearers have been found to exhibit similar characteristics and, in some cases, cocoon producing has become almost a hereditary occupation. From these observations it may be deduced that variations in the efficiency of labour are caused by the presence of hereditary skill among the rearers in certain countries.

In addition to the skill achieved through physical heredity, the force of association and unconscious imitation have an active influence on the absolute efficiency of the rearers. Strictly speaking, the period of training depends, to a large extent, on the co-operation of these two agents. A constant association with those members of the family who take part in the rearing and breeding operations, results in the acquisition of a natural instinct by the younger members of the family. Sooner or later this instinct develops into a partial skill and ultimately determines the efficiency of the rearer. This view is confirmed by an observation of the rearing operations in those localities where sericulture is either of recent origin or is being fostered. The efficiency of the rearers in these localities is comparatively at a lower level.

It may, therefore, be concluded that those agricultural communities whose forefathers have taken part in the

¹ "The Principles of Political Economy," Sidgwick, p. 105 (1901 edition).

production of cocoons, possess a kind of hereditary skill, and are more efficient in production than those who are newcomers in the field. But this conclusion does not exclude the absolute value of technical knowledge of the sericultural operations and the effect of adequate training on the efficiency of the rearers. The variations in the average annual output of cocoons in different countries with equal units of labour and capital, arise also out of differences in the technical knowledge and the acquired efficiency of those engaged in the industry, so that for an accurate calculation of the productiveness of labour the last two factors must be added to the previous factor of heredity.

So far, the human element plays a predominant part in causing variations in the efficiency of the workers, but as we pass to the reeling industry we observe different industrial conditions. In this branch of the silk industry the human skill is supplemented by machinery and, therefore, efficiency is determined, not only by the reeler's skill, but also by the type of the reeling machine he uses. In most of the modern silk-producing countries, variations in the average annual output of raw silk are due more to the efficiency of machinery than to the working qualities of the reelers. Generally speaking, skill due to physical heredity exercises little influence on the efficiency of the reelers and, for all practical purposes, we may say that both the qualitative and the quantitative nature of the output is determined firstly, by the period of training, and secondly, by the efficiency of the reeling machine.

To illustrate the above remark let us take a practical example. Before the notable progress made in the last decade of the nineteenth century, the reeling machine was still in its infancy. It was a common practice to reel off four skeins of silk at once and in this operation, stoppage of the machine due to a break in one, stopped all the four reels. This involved a considerable loss of time and impaired the output of raw silk. The introduction of a new reeling improvement however resulted in a better system, and at the end of the last century the reeling machine was much superior to the previous type. The new device prevented

the stoppage of all the four skeins when the end of one of them broke, and enabled the reeler to proceed with the reeling of the other three skeins. In this case, an increase in the productive capacity of the reeler, judged by his output, was due merely to mechanical inventions, and therefore the human element played a minor part in causing variations in the average annual output of raw silk.

A parallel instance is to be found in the invention of the fly-shuttle¹ which greatly increased the weaver's productivity in the cotton industry and thus considerably raised, not only the individual efficiency of the weaver, but also the average annual output of cotton goods. These two examples of mechanical invention afford sufficient evidence of the very important part played by machinery in determining the efficiency of the workers, and the position is further strengthened by considering the negative side of the question in which the silk-producing industry still follows the indigenous methods of production. In some parts of Bengal, for instance, the raw silk is still produced by means of the old hand-reeling machines, with the result that the product is much inferior to that of Italy and France, both in quality and in quantity, and the efficiency of the reelers is therefore on a much lower level. A further analysis of the reeling industry clearly shows that the application of "Increasing Returns" commences at this stage. It is due chiefly to the introduction of machinery that a tendency to increasing returns is observed, otherwise the production of raw silk would have remained on the same footing as the agricultural industries. The joint production of cocoons and raw silk introduces economies that remove the effect of "Diminishing Returns" to a great extent and make the industry more profitable on the whole.

The second part of the problem refers to the "measure" of efficiency and involves certain complications. First of all, it is necessary to indicate that the measure implies both the quality and the quantity of cocoons or of raw silk produced in a particular country. As the industrial and economic conditions in the silk-producing countries of the

¹ See "The Cotton Industry and Trade," by Professor Chapman, p. 26.

world are different in each case, it is practically impossible to find a universal application of the measure. For instance, the conditions under which the rearers and reelers in China work are entirely different from those in France and Italy, and, therefore, the measure of efficiency cannot be the same in these three countries. The measure can thus be applied only to individual rearers and reelers in a particular country.

In general the efficiency of the workers may be measured by the total *value* of the commodities produced within a definite period. In the case of cocoons, for instance, the rearer is expected to maintain a standard quality, and therefore the total value of his output depends not only on the quantity of cocoons but also on their quality. The greater the quantity of good cocoons produced by a rearer the higher is the price paid for his output. A good rearer in Kashmir sometimes obtains as much as 155 lbs. of cocoons from 1 oz. of seed,¹ while the average output per rearer may be much lower than that. In France the average quantity of cocoons obtained from 1 oz. of seed varies from 100 lbs. to 120 lbs., but a number of cases have been recorded in which the yield has gone above 150 lbs. per oz. There is no doubt that the output of cocoons per rearer gives a measure of efficiency, but, owing to varying climatic conditions and other difficulties in production, it cannot be regarded as an exact measure.

The above method of measuring efficiency also holds good in the reeling industry. The efficiency of the reeler may be measured more exactly by the output in this case than in the case of cocoons, as here the physical conditions of moisture and temperature remain more or less constant, and an added advantage is gained by a constant source of power. The measure is therefore to be found in the number of skeins of raw silk reeled per hour by an individual reeler or by two when the work is done conjointly. Due attention is paid both to the quantity and the quality of the raw silk produced within a definite time, so that the efficiency of the reeler is

¹ See "The Silk Industry in India," by Lefroy, p. 44. Reference in these cases is made to the quantity of fresh cocoons. The cocoons from the fresh state to the dry state lose between 60 to 65 per cent. of their weight.

directly proportional to the output and varies as the experience acquired in the manipulation of the thread. The larger the output per basin per reeler in a filature, the larger is the net output, and hence greater is the value of raw silk reeled per day. In this case again, the value of the commodity produced is a fair measure of the reeler's efficiency.

A critical examination of the problem of efficiency shows that from the point of view of measure only, an increase in the standard or a decline in the efficiency of the worker greatly influences the profits of the employer. But, in addition to this consideration, the problem has another aspect which directly concerns the worker, and determines the range within which the earnings of labour can move. In the next chapter while discussing the problem of wages, we shall have occasion to refer to the relation of efficiency to wages.

CHAPTER VII

THE PROBLEM OF WAGES

As explained in the last chapter, the labour in the silk-producing industry embraces the work both of unskilled agricultural workpeople who devote their energies to the production of cocoons, and of numerous semi-skilled reelers who make a further contribution to production by producing the raw silk from those cocoons.¹ As the supply of labour is directly related to the rate of remuneration on which the economic welfare of the workers depends, it is important that we should examine those industrial conditions which tend to cause variations in that share of the total value of production which goes to the labour. In addition to the interests of the producers, the problem of wages is closely connected with the interests of the consumers. An increase in the price of labour causes, other conditions remaining the same, an increase in the cost of production of the raw silk, and as this commodity is produced in countries widely different from each other in general respects, a high cost of production in one country leaves no scope for normal competition. In those countries where very efficient methods are not known, lower wages make up for a deficiency in the output, but the problem of competition as a whole still remains unsolved. We shall, therefore, study the question of wages under different conditions, and find a relation between the rate of remuneration and the productiveness of labour.

Before proceeding with the actual analysis, it may be pointed out that the cocoon-producing industry possesses two distinct aspects from the point of view of wages. The

¹ Here we are not considering the wages of management or of technical advice.

first aspect works under a system of "natural liberty" as in France, Italy, and other countries where the industry is not controlled by the State, and the second follows the conditions of monopoly, as in Kashmir. It is evident that under these distinctly different systems the rate of wages is governed by different economic laws. In order to avoid confusion it is best to deal with each aspect separately.

Let us first begin with the system of "natural liberty," which, again, is divided into two parts : the one dealing with the "cottage industry" system and the other with the "establishment" system. Whatever the system may be the wages of labour are determined by almost similar principles in both cases, the only difference being that while in the former case the rearer receives a payment by selling his cocoons to a reeler, in the latter case the labourer sells his labour to the employer for a certain fixed sum. The difference therefore lies in the form of payment.

The first important factor that exercises a great influence on the wages of labour in the cocoon-producing industry is the cost of living. In different countries the actual wages may, perhaps, equalise in the long run, but the money wages do not show any such tendency. This absence of equalisation in the money wages is due entirely to differences in the cost of living. In China, Japan and Bengal, the bulk of the rearers live on rice and vegetables under simple conditions, and do not, as a rule, receive more than about 3*d.* or 4*d.* a day. In France, on the other hand, owing to higher cost of living, the rate of wages is correspondingly higher. In pre-war days the women and men who directed operations in the sericultural establishments received about 1 franc 50 centimes a day with board and lodging, and the assistant workers received from 75 centimes to 1 franc a day according to age, with board and lodging.¹ The rate of wages has risen considerably during the war, and last year the sericultural workers received from 3 francs 50 centimes to about 5 francs per day. But a comparison between France and China, for instance, shows that the difference in the rate of remuneration

¹ "Histoire Économique de la Soie," by M. Beauquis, p. 50.

is proportional to the difference in the cost of living in these two countries. This difference, however, implies a universal application of the theory and does not concern the rate of wages in a particular country.

Let us now move from universals to particulars, in order to see how the relation of supply to demand affects the price of labour at a given period. For this purpose it is best to consider the labour conditions in a European country, as, apart from other considerations, the rate of remuneration in the eastern countries does not undergo visible changes within short periods. Taking the case of the French silk industry we find that there has been a continued increase in the demand for labour in recent years. Even before the war the wages of labour in the cocoon-producing industry showed an upward movement, due chiefly to a greater demand for rearers and breeders. On the other hand, the supply of labour became comparatively small with a consequent decline in the production of cocoons. At the outbreak of the war, owing to the mobilisation of labour for military requirements, a further decline in the supply of labour raised the rate of wages. Thus a greater elasticity in the demand for labour resulted in an increase in the price of labour, and if this increase shows a still further upward movement it may check the production of cocoons to a greater extent than before.

The next important point worth noticing is the effect of industrial competition on wages. As the cocoon-producing industry mainly absorbs agricultural labour, a general competition in the labour market produces changes in the supply. This is due chiefly to the fact that in a large number of cases cocoon production is regarded as a supplement to agriculture, and, therefore, whenever the agricultural crops offer larger monetary returns than does the cocoon crop, there is a tendency towards a change in the direction of the flow of labour supply. This tendency becomes an actual fact when there is a considerable rise in the prices of agricultural produce in comparison with those of silk which either decline or remain stationary. Under these conditions two things may happen ; either the rearers working in their homes may

give up the production of cocoons altogether, or they may demand higher prices for the produce. The former course is undoubtedly full of difficulties, but the latter also involves complications that tend to produce a depression in the reeling industry, as the filatures are not always willing to pay very high prices for the supply of cocoons. Moreover, if the wages also rise in the reeling industry simultaneously the ultimate increase falls on the consumers of raw silk.¹

In the "establishment" system, however, the employers are, as a rule, forced to increase the rate of remuneration when there is an industrial competition of the nature described above. This increase in the wages of labour corresponds to a general increase in other industries, and is therefore a legitimate increase from the workers' point of view. The ultimate effect on the price of raw silk is caused, as in the above case, through an increase in the price of cocoons.

It may be of interest to mention here that a gradual rise in the price of labour, due chiefly to the industrial competition, was one of the causes of the progressive decline in the production of cocoons in France during the last five years. With the opening of more remunerative channels of employment the labour force gradually drifted away from the silk industry. In some cases, however, the wages were slightly raised, as the maintenance of the labour supply was regarded as highly essential for the preservation of the silk industry. The Bengal silk industry exhibited somewhat different effects as regards the influence of competition in the labour market. In this case there was a competition between the rates of remuneration in the agricultural industries. The workers could earn more money by cultivating rice or jute than by producing cocoons, and thus the labour force gradually drifted from the latter to the former industries.²

It was believed by some people that competition in the labour market played a very insignificant part in the deter-

¹ This statement involves the assumption that the filatures are in a position to transfer the increase to the consumers of raw silk, that is, the silk manufacturers, who must either buy their silk from the former or go without it. The basis of assumption is partial monopoly.

² Professor Lefroy explains the ultimate effect of this movement in his report on "The Silk Industry in India," p. 12.

mination of wages in the silk-producing industry. The recent events, however, have shown that the silk-producing industry is liable to the same changes as any other agricultural industry. It is impossible to check a rise in wages at a time when other industries of a similar nature offer a more lucrative form of employment than does the silk industry, and therefore a competition of this kind is bound to result in an increase in the price of labour.

Lastly, the efficiency of labour joins the list of causes that bring about variations in the rate of remuneration. This factor can be equally applied to production under a system of "natural liberty" and to production under conditions of monopoly. For this reason it was considered necessary to examine the influence of this factor on wages at this stage of the present discussion.

A general observation of the industrial organisation in any country would show that, under ordinary conditions of production, remuneration is simply proportional to the quantity of work done by a unit of labour. This principle involves a simple assumption ; that the quality of work done is of a recognised standard. This being the case, the greater the quantity of cocoons produced per rearer, or per family of rearers, the greater is the return to labour, whether employed in the form of an individual rearer or joint rearers. The net earnings of a family of rearers therefore depend upon the total quantity of produce as well as on the price paid for it after deducting the minor expenses of production. It has been pointed out before that the output of cocoons varies as the efficiency of the rearer, but there are exceptions to this rule. These exceptions are proved under abnormal climatic conditions when production no longer remains within the human control. But for purposes of generalisation it may be safely asserted that, under any system, whether of "natural liberty" or of monopoly, it is only fair and just that the rearer should receive a proportionate share of the dividend in any silk-producing country. Unfortunately this rule is not always followed, and when the silk industry depends wholly on the benevolence of the State or is strictly a State monopoly, a general increase in the profits of produc-

tion, due to a rise in prices, makes no difference in the share of the individual rearer. This subject is, however, beyond the present scope, and will therefore be treated in its proper place. The main object of the present argument is to show that in the cocoon-producing industry the return to labour is simply proportional to the quantity of work done per rearer, which is represented by the amount of cocoons produced. I believe this method of remuneration exists in all the silk-producing countries of the world.

It may be noted here that the Kashmir silk industry is a State monopoly, and owing to a complete control of the sources of production and labour supply there is no room for a competition in the labour market. In the beginning of the enterprise, the agricultural communities were perhaps forced to take part in cocoon production, but now, owing to habit and tradition, the labour supply has become more or less spontaneous. Again, it is obvious that under conditions of a State monopoly, the law of demand and supply does not operate on the labour market, or to put it more correctly, the labour supply, as it is, loses the significance of a market. Nor does the industrial competition enter into the field to upset the balance of the labour supply, as the State decides as to which industry requires the largest number of workers. In the long run, we see that the only condition that determines the rate of remuneration under a system of State monopoly is the quantity of work done per rearer or per family of rearers. According to Professor Lefroy, a good rearer in Kashmir receives about £2. 10s. 8d. for 300 lbs. of cocoons, and most good rearers get 26s. 8d. clear.¹ The average rearer earns about fourteen shillings during a period of one month, or slightly more when he is engaged on rearing. If the rearer is efficient he can earn more by increasing his output, but beyond a certain limit the output of cocoons depends more on circumstances than on personal skill.

In the reeling industry at Srinagar (Kashmir), wages are paid on a system which can be described neither as piece-rate

¹ "The Silk Industry in India," Vol. I., Lefroy, p. 44. The actual figures given are Rs. 38 for 3 maunds 26 seers of cocoons, and Rs. 20.

nor as time-rate. A reeler gets 1*d.* per day per skein ; the four-skein or best reelers would therefore make 4*d.* per day. The boys turning the reels and the batteuses (cocoon beaters) are paid about 2*d.* per day. If the quality and the quantity of the raw silk reeled in proportion to the number of cocoons issued, is below the required standard, a fine is imposed on the reeler ; if, on the other hand, extra good silk is produced, a substantial bonus is given in addition to the wages earned by the reeler.¹ The bonus system acts as an inducement to the reeler and raises his or her efficiency in reeling.

The French reeling establishments have always adhered to the system of paying the workers at the time-rate. The reeling industry in France has passed through the various stages of economic transition, and on account of its national importance has always attracted particular attention both from the Government and from public bodies. The problem of wages has always been rather complicated, partly because of the selfish interests of the employers, and partly owing to the varying periods of depression and prosperity. On account of these events the situation has always remained more or less unsettled, and whenever changes have taken place they have either been very slow or have yielded practically invisible results. It will be interesting from an economic point of view to follow the trend of changes from the middle of the nineteenth century.

For a long time the workers in the filatures were paid monthly wages. The rate of remuneration was very low as compared with the nature and hours of work. The following scale was more or less common to all the filatures :—

Women reelers (<i>les fileuses</i>)	.	.	25 francs per month, sometimes 30 francs.
Girls or women performing accessory functions.	.	.	15 francs, 18 francs, and 20 francs per month, according to age.

¹ See "The Indian Silk Industry," Lefroy, p. 44. "A four-skeiner doing 9 to 11 deniers is given 1,440 cocoons and is expected to give up 22 tolas (9 ozs.) of raw silk. If he produces 19 and 18 he is cautioned, if he turns in 17, he is fined ; if his silk proves to have more than three ends per hour he is fined half a day's pay ; if he produces extra good silk he gets a bonus of 1½ days' pay."

This scale of wages allowed bare subsistence to the workers who, as a rule, could not afford to enjoy the luxuries and comforts of life. They had not only to feed themselves, but also to protect themselves against the vagaries of weather on these wages. Beds were no doubt supplied by the employers, but the workers had to provide themselves with heavier covering in winter. For this reason recruiting of labour for the filatures was not always an easy task.

This state of affairs continued for a long time, but when the proprietors of the filatures realised the labour difficulties they took up a liberal attitude (according to their point of view) and raised the wages of the reelers to 30 francs, 32 francs, and 35 francs per month, according to efficiency. In some cases even 40 francs per month were also paid, but these cases were comparatively rare. The wages of the cocoon beaters (*batteuses*) also increased proportionately. This new scale of wages, though more advantageous than the previous one, did not offer much inducement to the workers, and was readily acceptable only in the poorer districts of the Cévennes.

A later phase in the evolution of the system of wages was the introduction of "daily wages." This change involved a slight increase in the rate of wages and the new scale was fixed at 1 franc 50 cents. per day for the reelers, and from 1 franc to 1 franc 15 cents. and 1 franc 25 cents. per day for the cocoon beaters (*batteuses*). There was no change in the provision of accommodation, which still followed the old custom. This system remained in operation for a long time in the Cévennes. A rather interesting deviation from the usual custom was the employment of foreign labour, chiefly Italian, but this was resorted to only in cases of necessity.

In 1892 the French Government decided to grant an annual bounty of £160,000 (4,000,000 francs) to the reeling industry. The establishment of the bounty system did not improve the labour situation and the scale of wages remained the same till the year 1907, quite contrary to the expectations of the workers. However, during the year 1907, a labour strike in the filatures (notably in the Alais district) resulted

in an increase in the scale of wages.¹ This time the rate was fixed at 1 franc 60 cents. per day for the reelers and 1 franc 40 cents. per day for the "batteuses." It was impossible to regard this scale as stationary, and in consequence of some new improvements introduced in some of the filatures, the rate of wages was slightly increased in those places.

Again in 1908, a national congress of the silk workers was held at Theatre d'Alais, to call the attention of the Government to the conditions prevailing in the reeling industry. Delegates from various French filatures made representations to the Parliament to fix a minimum wage for the filature hands. On account of these representations, a number of amendments were brought forward during the debate in the Chamber of Deputies on the Silk Growing and Spinning Bounties Bill, with a view to improve the material condition of workers in French reeling factories by fixing a minimum wage, establishing an eight hours' day, and excluding from employment more than a certain proportion of foreign hands. The Government simply referred the matter to the Standing Labour Committee, who drew a report favourable to these proposals and called attention to the unwholesome nature of the work of silk reeling. It further pointed out that the long distance of most reeling factories not only gave additional labour to the filature hands by materially augmenting the ten hours a day work, but also made it difficult for the factory inspectors to visit the works as frequently as might be desirable. The Committee made no actual recommendations beyond simply declaring that the existing wages were inadequate to those conditions and invited the Government to draw up definite proposals for regulating wages and hours in reeling factories.² The absence of any improvements shows that the scheme was relinquished by the Government at that time. The wages were therefore governed by the old conditions, and the average rate stood at about 1 franc 60 cents. a day in the reeling factories till the year 1913.

There is no doubt that the wages have risen considerably

¹ See "Histoire Économique," by M. Beauquis, p. 94.

² *Cp.* "Trade and Commerce of the Consular District of Lyons," June, 1910, No. 4,483, Annual Series p. 34.

since the beginning of the war, but it is not possible at present, to estimate the exact variations that have taken place during the last four years. In the southern departments of France there was a visible increase of more than 100 per cent. in 1917, on the pre-war rate. The information received by me from direct sources points to a universal rise in wages, and, in some cases, the proprietors of the filatures are compelled to pay as much as about 4 francs per day. But this increase in the rate of wages of the filature hands does not indicate a proportional increase in their prosperity, as the cost of living has also considerably increased in France during the last three or four years owing to the war conditions.

A review of the economic features of the reeling industry clearly shows that there has been very little development in the system of wages. As regards the Far Eastern countries, such as China, it is difficult to trace any movement, perhaps owing to the limited range of necessities and comforts of life or to a very slow process of industrial evolution. But, at all events, even in the European countries, the progress recorded is practically insignificant. This is due chiefly to the fact that before the beginning of the present century and even some years after that, there was no definite labour organisation to safeguard the interests of the reelers, and the employers were generally inclined to dictate their own terms. So far as the French reeling industry is concerned, no systematic strike is recorded before the year 1907, from which it appears that the workers, as a rule, submitted to the dictum of their masters. This may, perhaps, be attributed to the employment of women and young girls, who readily accepted the terms of the employers owing to the force of circumstances.

Whatever may be the future of the silk-producing industry, an essential factor in production is the economic welfare of the workers. Under the new industrial conditions, the material and moral progress of the workers in reeling factories will be determined more and more by the nature and efficiency of organisation, both internal and external.

In dealing with the rate of wages in the reeling industry it must be remembered that the element of international

competition plays an active part in the determination of the scale of wages in Italy or France. Social conditions in China, Japan and India being entirely different from those prevailing in the European countries, it is very difficult for the French reeling establishments to raise the wages suddenly without risking a "knock-out blow" in the silk market. Even with a proportionately greater efficiency in France, the reeler cannot always compete with the Chinese reelers in prices of the raw silk, owing to a very low scale of wages paid to the workers in the latter country. Moreover, apart from the question of wages, there has been a marked improvement in the quality of the Far Eastern raw silks in recent years, and this new factor makes the competition still more difficult for the French reelers.

In the light of these observations, it is evident that success in the reeling industry depends, to a large extent, on the cheapness of labour. The Kashmir silk industry has shown marked progress during the last fifteen years, and apart from the efficiency of organisation the success has been due to the cheapness and adaptability of the labour employed in the filatures. There are other factors of considerable importance in production, which we have already discussed. One of these factors which we have omitted so far is the source of power for the reeling factories. Before proceeding to an analysis of the Cost of Production we shall inquire into the importance of the last-named factor.

CHAPTER VIII

SOURCE OF POWER

THE question of power supply has always been one of great importance in the textile industries. Before the period of extensive international trade commenced, the production of textile fibres was measured more or less by the satisfaction of internal demand, but with the growth and development of navigation and commerce, international exchange of commodities assumed a much wider extent. The result of this expansion was, that the producing countries had to supply a larger demand and were therefore required to increase their output accordingly. In China, Persia and India this object was achieved by increasing the supply of labour. For instance, during the period of the East India Company, the production of raw silk in Bengal was increased by increasing the number of rearers and reelers. But in France the problem of production was attacked in another way. The establishment of proper reeling factories modified the whole situation, and instead of continuing the system of hand-reeling, as was the case before the year 1830, water power was introduced to increase the amount of production and to facilitate reeling operations.

The English cotton-spinning industry had to face similar difficulties in the beginning. One of the principal features of its early history was the development of power, involving a process of gradual change from hand to water power and then to steam power. This kind of industrial evolution shows that the problem of power supply has always engaged the attention of the capitalists, and its importance is realised much more than ever before owing to the increasing spirit of open competition and international commercial relations. Moreover, internal economy in the reeling industry depends to a very appreciable extent on the proper utilisation of

power and, therefore, in anticipation of the future competition in the world's silk market, it is important that this problem should be thoroughly analysed so as to make the road clear for the future development of the reeling industry.

For purposes of illustration let us consider the Kashmir silk industry, which affords an example of recent change in the reeling methods. Before the establishment of the filatures and the commencement of State control of the industry, reeling was done by hand. But when the industry was organised on a commercial scale in order to meet the standard requirements of the market, it was necessary to abandon hand reeling and to adopt new methods. The new era in the reeling industry in Kashmir began with the organisation of the filatures and the problem of power demanded a solution at the very start.

It will be necessary here to divert to a brief reference to the fundamental processes involved in the reeling of raw silk from cocoons. The first important process is known as "battage," which involves the beating of cocoons in hot water with a brush so as to take up the end of the silk threads. In Kashmir and in almost all the modern filatures, water is heated by means of steam which runs through pipes connected with the basins in which the cocoons are beaten. The second process is the finding of the ends of two, three or more cocoons in order to obtain the thread which, after "croisure,"¹ passes on to the reel. This operation also requires hot water, and the cocoons remain in the basin while they are being reeled off. In this case water is either heated by steam or by electricity. In Kashmir, both the steam heating and the electric heating of basins is to be found, but in a large number of French filatures steam is quite commonly employed for this purpose. The third process is the turning of the reel, which is the most important of all from the point of view of power supply.

As already explained in a previous paragraph, formerly hand reeling prevailed in almost all the silk-producing countries of the world. Even at the present time hand reeling is quite common in China and in Bengal. In Kashmir

¹ See Chapter XII., p. 152, for the meaning of this term.

this system is still followed in some of the filatures, but in France it is merely a matter of historic importance now. The subject, however, demands a careful consideration, not only from the point of view of an economic analysis of the industry but also from the point of view of future economy in the production of raw silk.

The first important function performed by power reeling is the regularity and smoothness of motion which makes the operation of drawing off the cocoon thread easier and simpler. In hand reeling this work is done by manual labour, and in spite of very careful turning the motion is not always uniform; the result being, that the thread is not drawn off the cocoons at a constant speed and there is a chance of reeling irregular raw silk.

Again, the power-driven reels have an added advantage in having a small lever which enables the fileuse to start and stop each reel separately. There is thus a regular control of the reeling operation which does not require great skill. Moreover, by means of this simple mechanical arrangement, each fileuse can reel four skeins or more simultaneously at a high speed. Thus in comparison with hand reeling, the output increases enormously by using power, and the quality of the raw silk produced is more or less uniform if the reelers pay due attention to their work. The open competition in the world's silk market necessitates production on a large scale. This object can only be achieved by employing power instead of manual labour in the reeling industry.

Another great advantage of power reeling is its effect on the period of apprenticeship. In the hand-reeling system the boy turners do not pay much attention to the actual process of reeling, and thus do not utilise the opportunities afforded them by the environment. But when the boys or girls are employed to act as assistants to the reelers or commence with cocoon beating, the period of their apprenticeship is curtailed a good deal, and by constant watching they learn the rudiments of reeling in a very short time.

Above all, the employment of boys as turners in a reeling factory is detrimental to their future prospects in life. At an early age they should devote their energies to better

purposes than turning the wheel, and if the system of education is well organised, the State should enforce a limit under which the employment of boy labour should be prohibited. In Kashmir the filatures are going to be all power driven. This scheme would undoubtedly, raise the level of the reeling industry, and would enable the reelers to produce much bigger quantities of raw silk. When the factories are fully equipped with power-driven reels, there will be no surplus of cocoons left for exportation. If, however, the output of cocoons is not sufficient to meet the requirements of the plant, resort can be taken to the importation of cocoons from Central Asia. Thus the danger of leaving the plant idle can be avoided, partly by increasing the production of cocoons and partly by taking measures to hold sufficient stocks in hand.

The practical solution of the problem of power supply lies in locating the source of power. There are two important points worth considering in this connection ; the first is the nearness to the source, and the second is the cheapness of supply. Both of these factors determine economy in production, and, therefore, they must act in conjunction with organisation of the reeling industry.

In France steam power is used for driving the reels. The filatures are equipped with boilers, which supply steam for heating the basins and also for supplying power to the reeling machines. This method is, on the whole, quite economical, as there is a proper utilisation of steam for all purposes in the filatures. Water power is more universal in Italy than in France, and it is supposed to give greater regularity than steam power. But the choice of either method depends more on the nearness and cheapness of source than on its efficiency, which does not vary to any appreciable extent. In a country like Kashmir the full utilisation of steam power would involve great expenditure, and the difficulty would increase in proportion to the expansion of the plant. In the first place, the supply of coal is very scarce in Srinagar, and in the absence of this supply the filatures are provided with large quantities of wood. It may be possible to continue this practice for some time, but ultimately it is bound to

reduce the number of trees in the woods of Kashmir, especially when the reeling factories increase in number. If this reduction goes on for a number of years it may become a positive danger to the forests and may reduce the timber supply to a considerable extent. Another difficulty is that of lack of transport facilities, which makes the possibility of maintaining a regular coal supply very remote.

On the other hand, the utilisation of water power seems much more economical than steam power in Kashmir. Water at a high level can afford sufficient pressure which can be either used as a driving force or converted into electricity. As a matter of fact, electric power is already used in the filatures both for heating the basins and for driving the reels, and its further extension will undoubtedly facilitate the reeling operations. There is no doubt that the cost of installation considerably raises the outlay, but it is only the initial cost that brings in this increase. After the plant has been once established the increased expenditure is more than balanced by an increased output. Thus there is double economy in this system; firstly, the conversion of natural resources into economic resources, and secondly, an increased production of raw silk.

It is obvious, therefore, that in those silk-producing countries which possess water power as a natural adjunct, the source of power for the filatures can be easily found if other conditions are favourable. Steam power is not easily available, and is generally more expensive than either water or electric power when means of transport are limited and coal supply is far from the reeling centres. There is thus a close relation between power supply and the geographical situation of the silk-producing countries.

We shall now proceed to analyse the Cost of Production, so as to study the influence of those economic factors that determine the margin of profits in the silk-producing industry.

CHAPTER IX

COST OF PRODUCTION

IN the previous chapters of this section we have made an economic analysis of the various factors in production, and have shown how each of them is ultimately related to the average annual output of cocoons and raw silk. The next problem is to ascertain how these factors enter into the cost of production and to what extent they influence the profits of the producer. As the economic conditions in different silk producing countries vary in detail, the cost of production cannot be based on a standard criterion, and, therefore, the accuracy of the analysis will depend to a large measure on the nature of the particular cases under consideration. Variations in the supply of labour or in wages must, of necessity, cause corresponding variations in the cost of production, but the profits of the producer are determined, to a greater degree, by the prevailing prices of the commodity produced than by slight changes in any of the items that make up the cost.

Before proceeding further, it is advisable to have a clear notion of the cost of production as applied in the production of cocoons and raw silk. In order to avoid confusion in the determination of the actual cost of producing a definite quantity of raw silk, the cost of transport, and other charges due to the factor of uncertainty and waiting, may be excluded from the present calculation. The cost of production in the present case, therefore, includes only those items which make up the final cost after the commodity leaves the producer and passes on to the merchant. This procedure of analysis involves the assumption that there is a ready market for the produce, and that the producer does not incur the expenses of holding the stock for a long time. Apart from the presence of this assumption, the actual market

conditions show that the cocoon producer, as a rule, finds buyers as soon as his harvest is ready. With these preliminary observations we are now in a position to consider each item of the cost of production separately.

First of all, there is a movement from the production of the seed to the production of cocoons. As we have already remarked, this movement is the fundamental basis of the silk-producing industry. The first item is, therefore, the price paid for a definite quantity of the seed. For purposes of clearness we shall take an ounce of seed as our unit and base all further calculations on this unit. It is a matter of common knowledge in France and perhaps in other silk-producing countries that there are no sudden variations in the price of silkworms' eggs. Therefore, in so far as the cost of production depends on the purchase of the seed, difference in the price of the seed at two different periods may be regarded as insignificant.

The second factor that exercises a considerable influence on the cost of production is the price paid for the mulberry leaves required to feed the silkworms raised from an ounce of seed. Various methods are adopted to obtain the requisite supply of leaves. The simplest case is that of a rearer who buys the requisite quantity of leaves from a mulberry planter and pays according to the current rates. But the farmer who owns the mulberry and produces cocoons is in a different position. He does not buy the leaves from an external source, and thus escapes the expenditure of the money which is a part of the initial outlay in the former case. Both of these methods are invariably adopted in France, and the operations are carried out without any complications. The difficulty of judgment arises when we consider the case of "renting the mulberry lands," that is the case in which the rearer rents a plot of land and grows his mulberry on it.

The system of renting the mulberry lands was formerly quite common in Bengal. The land belonged to the land-owners and was given to the cultivators, who either planted fresh mulberry trees on it or developed the existing supplies. The rates for these lands were governed by three conditions :

(1) the site value of the land¹; (2) the number of the mulberry trees on it; and (3) its proportional productive capacity for other crops. A point of great economic interest is that the cultivators could afford to pay high rates when the market prices of raw silk were high, but on the other hand, when there was a fall in prices the margin of the producer's profits disappeared and, consequently, the cultivator was unable to pay high rents. There was thus a double reaction. Firstly, the high rates automatically raised the cost of production, and secondly, a fall in the market prices of raw silk caused a reduction in the demand for mulberry lands. If these lands had been exclusively mulberry lands, after a period of reaction the rates would have come back to a mean between the minimum and the maximum of the whole period, but as other crops such as tobacco, potatoes and sugar cane could be grown, the rates remained high for a long time. The economic consequence of these high rents was that the cost of production remained at a high level, and owing to a fall in the prices of raw silk, the profits of the cocoon producers were considerably reduced.

The case cited above possesses a good deal of historical interest, but from personal inquiries it seems to me that there is not much difference in the rents charged for mulberry lands and lands of a similar quality on which other crops are grown. This factor has never hampered the progress of the French silk industry, and under the present conditions is not likely to have any effect on the cost of production.

The Kashmir silk industry is free from these complications in another way. The industry is entirely a State monopoly, and the mulberry trees are appropriated by the Department of Sericulture. The rearer thus receives an allotment of trees from the State to secure a regular supply of leaves. In this case, therefore, the cost of production does not include the price paid for the silkworms' food supply so far as the cocoon producer is concerned, but in the final estimate this item must appear as the State incurs the necessary expenses of maintaining nurseries and planting fresh mulberry trees all over the country. It is not an easy task, however, to

¹ In Bengal the mulberry is grown on high lands.

determine this part of the cost, as the outlay is spread over many years and in particular cases includes the management charges.

The third factor which enters into the cost of production is the price paid for "additional" doses of labour. This factor is not universal, and manifests itself only when the employment of extra labour is necessitated by the smallness of the rearer's family.

TABLE A.

Item.	Price in Francs.
1 oz. of seed	10
1,000 kilos of mulberry leaves (at 5 frs. per 100 kilos)	50
Wages of one woman for 30 days { for 2 oz it is }	45
at 1 fr. 50 c., or wages of one { the same as for }	
for 15 days at 3 frs. { 1 oz. }	
Cost of incubation	1.50
<i>Papier à déliter</i>	6
Miscellaneous (fuel, heating, etc.)	8
Total	120.50

In addition to the charges noted above there are other minor expenses (such as the price of muslin nets and perforated paper,¹ etc.) which are included in the cost of production. Strictly speaking, some of the miscellaneous items of expenditure arise out of variations in the climatic conditions of different countries, though some are absolutely necessary and common to every silk-producing country. The cost of producing cocoons from an ounce of seed, therefore, depends on the aggregate charges incurred for the purchase of seed and the mulberry leaves, the price of labour, and other minor charges.

Let us consider the influence of each factor on the cost of production by examining some practical examples.

¹ The network of muslin or perforated paper is used in the hatching of the eggs to avoid the mixing of unhatched eggs and the egg-shells out of which the worm has emerged.

M. Maillot, in his "Treatise on Sericulture,"¹ gives three different cases showing three different aspects of production. The first is the determination of the cost of production in the case of a rearer who commands neither the labour supply nor the mulberry leaves and has, therefore, to pay for both of these essentials. The cost of producing cocoons from an ounce of eggs in this case will be as shown in Table A on previous page.

The average yield of cocoons from an ounce of seed varies from 50 to 70 kilos. The sericulturists are of opinion that the French rearer, under normal conditions, should get at least 50 kilos of cocoons from an ounce of eggs; so that the minimum yield may be estimated at 50 kilos without even the least possibility of introducing the element of exaggeration. Similarly, the minimum price of cocoons may be taken as 3 francs per kilo, although the average selling price undergoes fluctuations and has invariably exceeded this limit since 1900. The net returns will therefore be found by deducting the cost of producing 50 kilos of cocoons from the gross earnings of the rearer.

TABLE B.

	Francs.
50 kilos of cocoons at 3 frs. per kilo	150
Bounty paid to the rearer by the Government for 50 kilos, at 0.60 fr. per kilo of cocoons	30
Gross earnings	180
Cost of producing 50 kilos of cocoons	120.50
Net earnings	59.50

The rearer thus receives nearly 60 francs for his labour in a period of a little over one month, and finds himself in a good position to devote his energies to the next agricultural spring crop.

The second case given by M. Maillot is that of a rearer who is in a position to utilise the services of the members of his

¹ M. Beauquis refers to these examples in his "Histoire Économique de la Soie," p. 60.

family and is also in possession of the mulberry trees. The cost of production in this case will be determined in the following manner :—

TABLE C.

Item.	Price in Francs.
1 oz of seed	10
Cost of incubation	1.50
Miscellaneous	10
Total	21.50

Allowing the same minimum yield per ounce of eggs and the same minimum price per kilo of cocoons as in the preceding case, the net earnings realised by this rearer will be

TABLE D.

Item	Price in Francs.
(a) <i>Expenditure.</i>	
2 ozs. of seed	20
Rent for the premises	20
Cost of installation of premises	15
Hiring of labour for 30 days at 1.50 fr. per day	45
Fuel, etc.	5
<i>Papier à déliter</i>	5
Advance on 40 mulberry trees at 0.75 fr. per tree	30
Transport of leaves	15
Miscellaneous	5
Total	160
Yield = 57 kilos of cocoons per ounce of seed.	
(b) <i>Returns.</i>	
114 kilos of cocoons at 3 frs. per kilo	342
Bounty paid to the rearer by the State at 0.60 fr. per kilo of cocoons	68.40
Sale of waste, etc. (cocoon and other waste)	5
Gross earnings	415.40
Net earnings	255.40

159 francs 50 cents. It must be remembered, however, that this amount represents the aggregate of the rearer's earnings and the price of the mulberry leaves. Moreover, it also includes the share of the other members of the family.

In the two cases given above, the rearer was supposed to possess the necessary place for rearing purposes. In the third case we shall consider the cost of production, and the earnings of a rearer who possesses neither extra labour nor the mulberry leaves, nor a proper rearing house, and who therefore hires a room or two and pays the rent. The net balance of earnings of a rearer for rearing 2 oz. of seed will be as shown in Table D on p. 130.

Year.	No. of Rearers.	Ozs. of Eggs for Incubating.	Cocoons Produced.		Quantity of Raw Silk Obtained.	
			Kilos. ooo's omitted.	Lbs. ooo's omitted.	Kilos. ooo's omitted.	Lbs. ooo's omitted.
1904 . .	125,244	183,443	7,825	17,216	625	1,375
1905 . .	123,761	189,279	8,009	17,620	632	1,390
1906 . .	122,045	178,303	7,520	16,545	605	1,331
1907 . .	124,463	188,360	8,396	18,471	650	1,430
1908 . .	123,804	187,073	8,409	18,500	656	1,443
1909 . .	119,067	183,181	8,546	18,602	666	1,466
1910 . .	114,283	178,719	4,269	9,393	320	704
1911 . .	102,605	141,724	5,109	11,240	402	884
1912 . .	99,360	132,534	6,233	13,714	505	1,111
1913 . .	90,517	126,678	4,417	9,718	355	781

The analysis given in Table D, relating to the cost of production and the producer's earnings, clearly illustrates the importance of the supply of mulberry leaves and the participation of several members of the family in production. The second point worthy of notice is, that the sale of cocoons assures reasonable profits to those who practise sericulture. Above all, the initial outlay is so small that the agricultural communities in France and other countries can easily afford to invest small sums of capital in the production of cocoons. There is no doubt, however, that the margin of profits is determined in the long run by the prices of cocoons. In France, prices have been fairly high during recent years, but in spite of this advantage the production of cocoons has

declined. The table on p. 131 shows the progressive decline both in the number of rearers and in the quantity of cocoons produced during the years 1904 to 1914.

TABLE E.

Item.	Price in Rupees.
(a) <i>Expenditure.</i>	
12 puns, 16 gondas (i.e., 1,024 of seed cocoons) .	2
Mulberry leaves	25
Payment for labour and cultivation of half a bigha of land	5
Total	32
(b) <i>Returns.</i>	
Selling price of 20 kahans ¹ of seed cocoons at Re. 1 per kahan	20
Selling price of 60 kahans of cocoons for reeling .	50
Gross earnings	70
Net earnings	38

It may be observed here that the decline in production in this case was quite independent of the cost of production,² as a rise (if any) in the prices of various factors was balanced by a corresponding rise in the price of the commodity produced.

For purposes of comparison, let us take the case of the Bengal rearer whose main occupation is the production of cocoons and whose family also takes part in the rearing operations. It is almost impossible to compare exactly the Indian production and the French production of cocoons, owing to marked differences in the economic conditions of the two countries. The case shown in Table E,³ given

¹ The word "Kahan" implies number; one kahan is equal to 1,280 cocoons.

² Perhaps the principal cause was the depression in the industry due to disease among the worms in 1853, before which the rearers were accustomed to enormous profits, and also the extreme ignorance of the elementary economic principles in which the peasants of the Midi lived. Other reasons have been given in a previous chapter. Cp. Beauquis, as above, pp. 61-62.

³ "The Silk Industry in India," Vol. I., p. 19.

by Professor Lefroy, however, roughly illustrates the fundamental aspects of the cost of production and the marginal profits of the Bengal rearer.

The rearer and his family earn Rs. 38 (£2. 10s. 8d.) in about two months during which they are engaged in the production of cocoons. The operations are repeated four times a year, with occasional fluctuations in yield and returns. The prices obtained for cocoons do not remain constant throughout the year, and so the rearer secures an average income of about Rs. 20 (£1. 6s. 8d.) per month for the whole family.

A glance at the figures given above, shows that the net earnings of a rearer are much higher in France than in Bengal. In the former country, the individual earnings of a rearer are about fifty shillings per month, while in the latter the collective earnings of the whole family are less than thirty shillings per month. The causes explaining the difference in earnings are not far to seek. In the first place, the French rearer is, nowadays, better supplied with the instruments for destroying the diseases of the silkworm than the Bengal rearer, and, therefore, the former is more likely to obtain a larger yield than the latter. Secondly, the French rearer receives a bounty of 30 francs for every 50 kilos of cocoons, and thus adds to his earnings by means of this extra financial help from the State. On the other hand, the Bengal rearer depends mainly on his good fortune and, without any official sympathy, tries to raise his earnings, which are ultimately determined partly by a successful crop and partly by market conditions.

The determination of the cost of production in the reeling industry is much more complicated than in the production of cocoons. As we have already seen, the normal conditions of production are quite different here owing to the multiplicity of functions under the factory system. The constant running of a filature involves establishment and management charges, lighting and heating expenses, and the initial outlay on the installation of power. In addition to these charges a sinking fund is necessary for meeting charges arising out of the depreciation of machinery and other incidental expenses. Interest on capital and insurance premiums have also to be

paid out of the cost of production, so that the presence of these multiple charges makes the estimate of producing a definite quantity of raw silk very difficult. A careful investigation may, however, solve the problem satisfactorily, but so far it has not been possible to ascertain the exact average charges in the French filatures. Even if it were possible to obtain a rough estimate, the solution of the problem will be one-sided only, dealing with the profits of the employers, as the workers in the filatures are paid regular wages and an increase in the gross earnings of the establishment will not necessarily imply an increase in the earnings of labour.

It will be interesting, however, to dwell on the principal items in the cost of production, in order to show how each item affects the cost. The first important point to note is the yield of raw silk from a given quantity of cocoons. As a rule, the larger the yield, the lower is the cost of producing a definite quantity of raw silk. The average yield in France is taken as about 1 kilo of raw silk from 4 kilos of cocoons, but this limit is invariably exceeded in some of the modern filatures. In Bengal, I believe the average yield is about 1 kilo of raw silk from nearly 5 kilos of cocoons, and in Kashmir, the yield is a little higher than that. A larger yield tends to increase the total value of the commodity produced, and at the same time enables the producer to spread his total cost of production over a larger number of units. And, as the fixed charges do not rise in the same proportion as the increase in the total magnitude of the business, the result is, that there is a corresponding reduction in the cost of production per unit. Another great advantage of a large yield is that the employer secures a great economy in the labour charges.

The next important point in the cost of production of raw silk is the variation caused by the size of the raw silk to be reeled. It has been observed before, that the output per fileuse per basin is governed by the particular size of the raw silk she is required to reel. A finer thread of raw silk demands greater care and attention than a coarser thread does, and, therefore, production per reeler per day is greater

in the latter case than in the former ; so that the price paid for labour is higher when the quantity of raw silk is very fine than when it is very coarse. A difference of this kind in the labour charges produces a difference in the costs of production of two widely different sizes of raw silk.

As regards the particular items in the cost of production, we shall have to refer back to the yield of raw silk from cocoons. Let us suppose that the price of raw silk reeled in France from the French cocoons is about 40 francs per kilo. as it leaves the filature. If the price of 4 kilos. of cocoons from which 1 kilo. of silk is obtained, is 3 francs per kilo. (as was formerly assumed), the total price paid for the "raw material" would be 12 francs. And if a sum of 6 francs has been paid for the labour employed for reeling this silk, the total charges for the "raw material" and labour amount to 18 francs, leaving 22 francs per kilo. for all other charges. mentioned in a previous paragraph. Strictly speaking, the sum of 22 francs includes a bounty of about 5 francs paid by the State ¹ to the reeler. If the system of bounties did not exist the difficulty would perhaps be enormous, especially in the face of the Japanese competition.

It is obvious from the analysis given in the last paragraph, that about 50 per cent. of the filature selling price of raw silk is the price of the raw material and labour. There is no doubt that the great improvements effected in the reeling machinery in recent years have considerably helped the problem of output in the filatures, but on a general survey it is evident that the profits of the filatures depend largely on their constant running throughout the year, and also on an easy accessibility to large stocks of cocoons. Production on a large scale in this case, as in any other, introduces great internal economies, and thus reduces the possibility of loss to a minimum.

We have now discussed nearly all the important questions relating to the production of cocoons and raw silk. It would be rather instructive at this stage to group the various questions together, and to see how the entire subject is related to the "organisation" in the silk-producing industry.

¹ Bounties in reeling work out at nearly 5 francs per kilo.

CHAPTER X

ORGANISATION IN PRODUCTION

(a) THE COCOON-PRODUCING INDUSTRY

THE economic importance of the various factors of production has been fully discussed in the last section. It has been clearly shown how, with the active co-operation of Nature, the human labour becomes the ruling agent in the industrial mechanism of the silk-producing industry. There is no doubt that the production of cocoons depends mainly on an abundant supply of labour and on other economic factors which we have already described, but the mere presence of these factors, by no means affords the final solution of the problem. The ultimate success in production can only be achieved, as in other industries, by a proper utilisation of the economic resources of the silk-producing countries. This utilisation of the economic resources depends, in its turn, on the quality and strength of the organisation which exists for purposes of conducting the necessary operations within the silk industry. For this reason, it is necessary, at this stage of our inquiry, to study the system of organisation in production.

Before going further, however, it may be observed that the organisation in the cocoon-producing industry is divided into two parts, industrial and commercial! The former is undoubtedly more important than the latter, as in the absence of a successful harvest of cocoons, the necessity for its disposal does not arise. Moreover, the industrial organisation in this case involves a number of difficulties which are sometimes beyond the producers' control, while the commercial organisation is comparatively simple on account of the existence of ready markets and the simplicity of transactions. We shall, therefore, commence with an

analysis of the industrial organisation, in order to see how far its efficiency determines the economic development of the cocoon-producing industry.

The industrial organisation in the cocoon-producing industry has two distinct aspects, which are more or less interchangeable according to the economic conditions of the country concerned. The first aspect may be described as a form of complete integration, in which the product is made under the direction and control of one management. This form of organisation, if carried to extreme, becomes a monopoly in certain cases. The Kashmir silk industry affords a very good example of this system. The seed is either purchased or produced by the State, the mulberry trees are appropriated by the Department of Sericulture, and the industry is conducted under the management of this department, so that the production of cocoons is entirely under the State control from the first stage to the last, when the goods are ready for sale.

The French producers in former years followed a system only slightly different from the one described above. The industry was practised under a limited control. The rearers received their seed supply from the "graineurs" and, after completing the sericultural operations in their homes with their own appliances, delivered the cocoons to the central establishments where they were paid according to the quantity produced. Some "graineurs," however, exercised complete control over the rearings, and insisted on production being conducted under one management throughout. This form of organisation involved the hiring of labour and made the rearers wholly dependent on the sericultural establishment for their livelihood, and thus it was found necessary to abandon the system of complete control. Moreover, the process of industrial evolution (though comparatively slow in the cocoon producing industry) gradually modified the ordinary working methods, and the system of organisation in France was transformed from a dependent to an independent one. At the present time the production of cocoons is mainly independent, though the seed-producing establishments still direct operations and render valuable services in

scientific and technical matters to the silk-producing industry.

The first important feature of the industrial organisation, whether in the form of complete integration or in limited control, is the distribution of the seed. There are two essential points which demand the careful attention of the organisers of distribution. The first is the complete geographical survey of the province in which the seed is to be distributed among the rearers. This survey may be easy if climatic conditions are uniform throughout the whole locality, but if there are distinct variations, as is the case in certain parts of France and in many parts of India, the task becomes much more complicated. It has been held by an experienced sericulturist in Var (Southern France) that two different localities at a distance of twenty miles apart, sometimes exhibit marked climatic differences from a sericultural point of view. It is obvious, therefore, that within a radius of 100 or 200 miles, it is quite possible to find great variations in temperature and rainfall, and if these variations are ignored, the chances of success become very remote.

Again, if the agricultural communities who take part in the production of cocoons are scattered in different parts of the country, the distribution of the seed becomes difficult, especially when these parts are not connected by railways or other transport system. In this case the number of distributing houses depends on the number of different localities in which the seed is to be distributed. In addition to the organisation of stations for distribution, it is necessary to introduce a system of registration of the rearing families, so as to keep a complete record of the agriculturists or peasants engaged in the production of cocoons. The first part of the industrial organisation therefore includes the exact geographical localisation and the registration of the agricultural communities.

On the technical side of distribution of the seed, a number of difficulties have been experienced by the majority of the silk producers in every country. In the first place, it is absolutely necessary to issue seed free from disease. This has been successfully achieved in France and in other coun-

tries by the modern methods of seed testing, and further scientific research in sericulture may remove the obstacles that have hitherto hindered the rate of progress in cocoon production. Another point of great scientific and economic interest has been the development of races of the silkworm. In France the Var breed has been largely used, as it was found to be the most productive. In recent years the French sericulturists have adopted a mixture of the Var and the Italian races, and in some cases a cross between the French and the Chinese or Japanese races. As the commercial value of the fibre depends on the delicacy and strength of the fibre, it is always advisable to adopt the method of cross-breeding, so as to obtain the good qualities of two different races. Moreover, the yield of cocoons per ounce of seed may be greater from a mixed race than from a pure race, and therefore from a purely economic point of view it may be advantageous to try a mixed race. It may be of interest to note here that the question of races is best decided with reference to the climatic conditions of the country concerned. For instance, the French race, though very productive in Southern France and Kashmir, is quite unsuitable for Bengal, owing to a vast difference in the climatic conditions. The problem, as a whole, is purely sericultural, and, therefore, may be left to the sericulturist for the present.

The second important point in the industrial organisation is the method of inspection of the rearing, and of the rearers' dwellings. In order to obtain a successful harvest it is essential that the rearing rooms should be properly ventilated and requisite space be given to the silkworms. The hygienic and sanitary conditions of the rearing houses determine, to a large extent, the final yield of good cocoons. Scanty space¹ and lack of cleanliness are bound to produce disastrous results, and, therefore, it is unwise to economise in space with the risk of losing a part of the harvest. The output of cocoons is greater under wholesome conditions than under unwholesome environment. For this reason it is

¹ "There must be 70 square yards of space for each ounce." This is one of the conditions of rearing in Kashmir. See "The Silk Industry in India," Vol. I., p. 43. Lefroy.

deemed advisable to organise a system of inspection, which not only supervises the sanitary requirements of the rearers' dwellings, but also gives valuable assistance and scientific advice during the period of production.

We have now examined the essential features of the industrial organisation in the cocoon-producing industry. For purposes of illustration, let us study the system followed in Kashmir. It has been pointed out before that the organisation is a form of complete integration, and that various operations in the production of cocoons are conducted under one management. The seed is issued by the Department of Sericulture shortly before the period of hatching. The amount issued varies as the number of members in the family and the size of the rearing house. The average quantity of the seed issued is about half an ounce per rearer. In certain cases the village representative or a landowner receives 50 ozs. for purposes of re-distribution among the villagers. The rearers receive their seed supply on a given date and at a given place, and are duly registered for the quantity issued to them.¹

The distribution of the seed is carried out by the available officers of the State, five of whom are appointed in the northern and five in the southern division. The rearers, after receiving the seed go to their homes and commence the rearing operations, which take about thirty-three days to complete. After the period of production, the cocoons are picked and brought to the factory in large baskets. The very distant rearers bring in sun-dried cocoons which are taken by measure.

The cocoons are inspected and carefully weighed at the factory, after which the rearers are paid according to the recorded weight. The crushed cocoons are put on one side, and distinction is also made between good and bad cocoons; lower rates are paid for the latter.

It will be interesting to observe here that in France, when the seed is issued by the establishments, the organisation is

¹ The latest information regarding the organisation of the Kashmir Silk Industry has been kindly supplied by Professor Lefroy, who completed his inquiry in 1916.

made more complete by the inspection of the rearings during the period of production, by a representative of the establishment. The defects in the method of rearing or the signs of disease among the worms are at once pointed out, and experimental tests of samples are made at the head office. This system of inspection performs two functions at the same time, firstly, it helps the rearer in his production by pointing out defects, and secondly, it prevents further loss in the output through disease or other causes affecting the silkworms.

Another point worthy of notice is that the organisation in the French establishments seems to be, on the whole, on a very firm footing. The system of central control is the result of past experience, and, at the present time, may be regarded as highly efficient. At Cogolin¹ (in Var, Southern France), the sericultural establishment is divided into several departments, each of which is under the charge of a special supervisor. The most important among these are the seed testing, moth, "croisement,"² and breeding departments. The cocoons received from the rearers are collected, recorded and graded in another department. The sizing and the determination of the "richness" of the cocoons is undertaken by an expert who reports on the quality of each lot. The head of the establishment comes in close touch with the work of each department and is daily informed of the progress made in each section. The original object of the establishment was, perhaps, only the production of the seed on a commercial scale, but as the business developed, other activities, such as the purchase and collection of cocoons, were also taken up. At the present time the establishment sends out cocoons to the neighbouring filatures and is, therefore, organised on a larger basis to meet larger demands.

It will probably be instructive to mention here that the system of organisation in the cocoon-producing industry in Bengal must essentially differ from that in Kashmir or in France. We have indicated in a previous chapter that the

¹ During my visit to France in July, 1917, I had the opportunity of studying the organisation of the sericultural establishment at Cogolin (Var).

² Where different races are crossed so as to obtain a mixed race.

rearing operations in Bengal are repeated four times during the year, as the race of the silkworm raised there is of a multivoltine type. The organisation required to conduct an industry in which the industrial functions are multiplied owing to the repetition of processes, must be more extensive and more efficient than the one which meets a comparatively smaller number of demands only once a year. The general principles of industrial organisation, however, must be similar in both the cases, if the industry is conducted on similar lines. But as it is, under the present conditions, the Bengal silk industry follows no definite system of organisation. It is neither under the official control nor under private management. The rearers buy their own seed and if the harvest is successful they sell the produce to the filatures. Improvements have been introduced in recent years and efforts have also been made to impart scientific knowledge to the rearers, but so far no definite form of organisation exists to make the industry a complete whole.

CHAPTER XI

SORTING AND SELLING OF COCOONS

IN the last chapter we have given an account of the industrial organisation in the cocoon-producing industry in France and in Kashmir, under a system of either complete control or limited control. The next step is to consider the commercial organisation when the industry is not controlled, for in that case the rearer is himself responsible for the disposal of his goods. In the former case the establishment (or the factory in the case of Kashmir) collects the cocoons and, after grading and packing, sends them to the filature, but when the rearer practises sericulture independently, he has to find a market for the cocoons himself.

Before finding a market the rearer gathers his crop and carefully sorts it, so as to keep the defective cocoons on one side. In France, the gathering of cocoons has always been marked with certain festivities. The friends and relatives of the family are invited to watch the ceremony, which becomes very important when the harvest is exceptionally successful. The cocoons are gathered in large baskets and carefully arranged according to their quality. The head of the family, being well acquainted with the different qualities of cocoons, personally supervises the process of sorting, which requires considerable experience and skill. The following kinds of cocoons are regarded as defective¹ :—

(a) Double cocoons which are generally very coarse, much larger in size, and of a more or less irregular shape.

(b) Satinée cocoons which possess a raised tissue and are soft to the touch like velvet.

¹ For these defects I have consulted Monsieur Laurent de l'Arbousset's book, entitled "*Cours de la Sericulture Pratique*," and also its translation by Elizabeth Wardle (1905), in addition to my personal knowledge of the subject.

(c) Glazed cocoons which are almost transparent, showing the inside of the cocoon, and have thin ends.

(d) Saffron cocoons which are, as a rule, of a golden yellow colour instead of pinkish yellow.

(e) Cocoons with black marks emanating from the inside are also regarded as defective.

(f) Dead cocoons having a decomposed chrysalis inside.

(g) Weak cocoons which do not resist the pressure of the finger and can be easily pressed in and out.

All cocoons with these defects are imperfect and defective, and are kept in a separate basket, as there is a different market for these cocoons. In a successful rearing of the Var breed or mixed breed, the proportion of double cocoons is generally 5 to 6 per cent., and of dead or weak cocoons about 3 per cent., so that between 8 and 9 per cent. of the crop is unsaleable in the proper cocoon market.

After the sorting of cocoons is finished, the rearer is anxious to sell the produce in order to realise the returns. In France there is no difficulty in disposing of the crop. A large number of filatures have been established in nearly all the principal centres of production, and therefore the sales present no commercial complications. The organisation is simple, and the market is generally free from speculative obstacles. A carefully selected sample of cocoons is taken into the market and submitted to the buyers either by the seller himself or by one of the brokers. The buyer examines the sample and satisfies himself as regards the quality, the grain,¹ shape, and colour of the cocoons submitted to him. He feels the ends and the mid-surface of the cocoons with his thumb and first finger in order to determine the resistance and the richness of the silk, and after a thorough test at the spot offers a price. If the price offered is agreeable to the seller, the commercial transaction comes to an end, the sample is kept by the buyer for further reference, and a day is fixed for the delivery of cocoons.

The cocoons are further examined and weighed on their arrival at the cocoonery. After deducting the quantity of

¹ The roughness on the surface of the cocoon is known as the "grain" of the cocoon.

waste, the net weight is paid for according to the price agreed between the buyer and the seller. If the quantity of defective cocoons exceeds the percentage declared during the transaction the seller is compelled to accept a certain reduction in the price.

It may be observed here that there is a distinct market for imperfect cocoons. These cocoons are unsuitable for reeling purposes and can only be used as waste silk by the spinners. For this reason the prices offered for these cocoons are generally about one-fourth of those offered for good cocoons. In France, the small merchants send their agents to villages to collect the waste and to buy all kinds of defective cocoons. Large quantities are thus collected and sent to Lyons for spinning purposes.

The system of commercial organisation in some parts ¹ of India is almost similar in nature to that in France. The rearers bring small quantities of cocoons to fairs ² held in different towns. The filature agents or other dealers who are present there offer prices after inspecting the various lots, and if the seller agrees to their offer the cocoons are sold on the spot. Prices offered by the filature agents in Bengal are generally lower than those offered by brokers in France, and for this reason the sales have become limited now.

A brief review of the commercial situation shows that so far as the producer is concerned the market conditions are fairly simple. In France during the last fifteen years the demand for cocoons has always been in excess of the supply, and the prices have remained steady at a fairly high level, with the result that there has never been any chance of the stocks remaining unsold in the producer's hands. The producer is, as a rule, anxious to sell his cocoons as soon after the harvest as possible so as to avoid the expense of drying, stifling, and stocking them for a long period. Thus there is

¹ Particularly in Assam and Burma.

² Some of these fairs were originally started with a view to facilitate exchange of commodities between various producers and were, therefore, strictly speaking, economic institutions. During the middle ages and right up to the beginning of the modern industrial era, the development of markets in India was achieved largely by the institution of quarterly or annual fairs in small towns. Among other commodities, cocoons were also offered for exchange.

a readiness on the part of the producer to sell and an anxiety on the part of the broker to buy, and the transaction is completed within a short time with the least amount of trouble.

There is, however, a certain amount of speculation in the cocoon market at Marseilles,¹ but its effect is felt chiefly by the filatures. The principal reason for this speculation is the importance of Marseilles as the second largest centre for cocoons in Europe (the first being Milan). There are a large number of importing firms who receive cocoons from foreign countries and undertake to supply the demand of the local steam filatures. Moreover, these firms buy ahead the supplies of cocoons available in Var and other provinces in Southern France.

The demand for cocoons is more or less constant when labour conditions are normal, but the same cannot be said of the supply. The filatures must keep the plant and machinery running throughout the year in order to maintain a satisfactory relationship between the output and the current charges, and hence the demand for the raw material must remain constant. But if in the meanwhile there is a sudden fall in supplies owing to some unexpected cause in the cocoon-producing countries, or if there is a partial failure of the French crop, the relation between demand and supply undergoes a complete change, and the equilibrium at the former price is upset. The brokers now raise the prices and sell the stocks in a favourable market. As the market is not highly organised nor extensive, the speculation is generally limited and the broker's profits are simply proportional to the risk he takes in buying ahead. Generally speaking, these market fluctuations are accidental, though some brokers hold that they specialise in the anticipation of market conditions. In so far as the present market conditions are concerned the spirit of speculation is not very keen owing to the fact that a large number of filatures were closed in the second year of the war. But a revival of the normal market conditions may bring with it an enhanced spirit of speculation.

¹ Marseilles stands foremost as a shipping centre, having direct shipping connection with the Eastern countries.

Above we have given a brief outline of the industrial and commercial organisation in the cocoon-producing industry. This leads us to a consideration of the reeling industry which we shall study in the next chapter.

CHAPTER XII

ORGANISATION IN PRODUCTION

(b) THE REELING INDUSTRY

THE economic evolution of the industrial organisation in the reeling industry is full of historic interest and affords a very useful knowledge of the growth of the modern filature. The real system of organisation was first instituted in Europe, and with the gradual development of the industrial processes it achieved wider limits and finally found its way in India, China and Japan. In France, as in Bengal, the reeling industry has passed through three distinct stages, whether of growth or of decline, and each stage corresponds to the economic conditions within the country and the market conditions abroad.

In both the countries the first period may be described as the period of "primitive organisation." Before the beginning of the nineteenth century the French reeling industry was widely scattered with no proper organisation and more or less confused with other agricultural occupations. Its operations were irregular and its output uncertain, with the result that the small quantities of raw silk produced by the agricultural communities of the Midi were bought by local merchants and finally transferred from the local centres to Lyons where they were consumed by the weavers. This period was marked with an absence of reeling machinery. The quality of the raw silk produced by means of the primitive appliances was poor as compared with the present day silk, but as there was no commercial organisation sufficiently well-equipped to test the various qualities sent to the market, the merchants unhesitatingly accepted whatever supplies they could obtain from the sericulturists. The fundamental

characteristic of this period was therefore the absence of any link between the producers, the dealers and the consumers. This disconnectedness was evidently the result of lack of specialisation and harmony in the industry itself.

The Bengal silk industry presents a similar case, but here the period of "primitive organisation" cannot be definitely fixed. Before the advent of the East India Company and before the initiation of the demand for Bengal raw silk in Europe, the industry was organised on purely indigenous lines. There was, no doubt, an unlimited demand for Bengal raw silks all over India, but there was no definite organisation to regulate the supplies and to place the industry on an economic basis. There was no co-operation between the reelers who formed individual units, and after producing certain limited quantities of raw silk, sold them to the local merchants at fairs or in markets where other commodities were also sold. The absence of machinery made hand reeling indispensable, and for this reason the product lacked uniformity of quality. But as neither the home markets nor the foreign markets were properly organised, no difficulty was experienced in disposing of the goods produced by the reeling industry.

The second period of the economic evolution of the French reeling industry began with a new system of organisation. It is in this period that we trace the growth of the modern filature. In the first few years of the nineteenth century, reeling by individual units began to disappear, and the new system involved co-operation of several reelers. This was the beginning of what may be termed "joint production" in the reeling industry. The ideas of division of labour appealed to the workers, and the rate of progress of this system was inevitably hastened by the introduction of steam-heating of basins in or about the year 1830.¹ The number of operations in reeling was multiplied by the application of motor power for purposes of turning the reels (winding wheels) and by the introduction of other mechanical devices. A large number of filatures were established in different

¹ M. Beauquis, in his "*Histoire Économique de la Soie*," gives a full account of this development.

sericultural⁷ centres and the reeling industry opened up another channel of employment for women and young girls. The second period was marked with prosperity and a very efficient industrial organisation based on capitalisation. Lyons was the central market for French raw silks. The industrial organisation was accompanied by commercial organisation which began to develop in the central silk market of France. During the period 1830-53 the French reeling industry attained its full growth, partly by the introduction of power and machinery and partly by organisation and specialisation.

Let us for a moment divert to the second phase of the Bengal reeling industry, which commences with the trading activities of the Dutch merchants and the East India Company.¹ In the beginning of the eighteenth century the agents of the Company in India started the export trade in raw silk. This silk was purchased directly from the Indian reelers who followed the indigenous methods and produced a commodity which did not exactly meet the requirements of the English market. After the middle of the same century the East India Company established silk factories so as to produce uniform raw silk and maintain a regular export trade. This was the beginning of the industrial organisation in the Bengal reeling industry. It is difficult to say how far the system of organisation adopted by the agents of the Company contributed to the actual advancement of the Indian silk industry, but it is obvious that their efforts led to the formation of filatures in Bengal, and the subsequent growth of the reeling industry was due mainly to this initial organisation.

Resuming the evolution of the reeling industry in France, we find that the third period begins at the termination of the year 1853. This is a period of successive decline from the point of view of industrial expansion and its signs are clearly observed even at the present time. The original cause was believed to be the outbreak of disease among the silkworms, which completely destroyed the crop in 1854, but subsequent events show that this was only a temporary period of depres-

¹ For a full account of the subject see pp. 25-27.

sion, and that the actual decline of the reeling industry began in 1858 when foreign raw silks invaded the Lyons market directly. The principal invaders were the Far Eastern silks which not only rushed into the European markets but forced their way into the Indian markets as well, and firmly established their position before the end of the nineteenth century. The Bengal reeling industry also suffered from a similar competition and by the middle of the last century the East India Company abandoned its control and left it to its own fate.

The most interesting feature of the reeling industry in France is the development of the system of organisation and of reeling methods during the third period. With the limitation of its extent the industry embraced new ideas of control, and the worker became more efficient in the manipulation of the thread. Unlike other textile industries, the silk-reeling industry did not wholly depend on inventions. The French *fileuse* acquired a special skill and attended to the delicate fibre with extreme deftness which became an important factor in the development of the internal organisation of the filature. It was chiefly by means of organisation that the French reeling industry was able to preserve its existence against the increasing competition of the Far East.

The modern French filature is the outcome of past experience. The principle of division of labour plays a very important part in its economic organisation, and is, strictly speaking, the basis of all improvements introduced in the reeling operations. Economy in time and labour is effected by a proper distribution of tasks amongst the various workers. The preliminary or accessory operations are performed by apprentices who acquire a reasonable amount of skill within a few months on account of their close association with other workers who are more skilled than themselves. Other internal economies are effected by the utilisation of steam for purposes of heating and power supply. The general organisation is based on a system of central control in which the superintendent of each section is directly responsible to the head of the filature.

Generally speaking, there are three principal departments

in a filature. The first of these may be called the "grading" section, where cocoons, after a careful examination, are graded into different classes according to their size and quality. Defective cocoons are kept on one side and other qualities are marked and put into large baskets for distribution in the "reeling" section.

The "reeling" section of the filature is the most important of all. The organisation of this section depends entirely on the system of division of labour, and is supplemented by various forms of inventions that have been introduced into the reeling industry in recent years. First of all, the process of cocoon beating (known as "battage" in France) is now carried on by means of a simple mechanical device. A circular brush which moves round its axis is fitted in the basin and can be easily worked by means of a lever. The rapid movement of the brush causes the cocoons to be sufficiently beaten in a short time. The beaten cocoons are then passed on to the "purger," who thoroughly cleans them and hands them to the fileuse. A considerable amount of time is saved in this way by dividing the preliminary work among three girl operatives.

The actual process of reeling requires great dexterity and attention on the part of the fileuse. The single thread, as it is drawn from the cocoons is not always uniform, and when two or three ends are joined together to form the final thread, the imperfections in the single thread are magnified. For this reason the system of "croisure" or crossing of the threads one over the other, is employed so as to remove the imperfections and to obtain a uniformly round thread. For a coarse size of the raw silk seven or eight cocoons are reeled off at the same time, while for a fine size, the ends of three or four cocoons are joined together. When one of the initial fibres breaks, the fileuse in charge of the basin at once joins it up in order to keep the size of the raw silk constant. Variation in size occurs only when the reeler is careless or incompetent.

Another point of economic interest is the utilisation of steam for automatic drying of the raw silk while on the reel. The final thread, after passing through the "croisure" and

over the supporting pulley, is distributed evenly on the reel, and is still full of moisture. The rotational motion of the reels takes place inside a large wooden box, closed on three sides and open on the fourth, through which the raw silk thread is received. This box is heated by steam pipes which run throughout its length and make the skeins dry. In this way a double economy is effected, firstly by the utilisation of steam and secondly by saving a subsequent process.

The most important economy, however, from the employer's point of view, is the minimum production of by-products. In reeling, the broken threads and exhausted cocoons are discarded as waste and are, strictly speaking, by-products of raw silk. The profits of the establishment are raised or lowered according to the quantity of waste produced in the filature, as the prices obtained for the by-products are only about one-fifth of those obtained for reeled silk. The employer is therefore always anxious to engage only those reelers who are efficient and who produce the minimum amount of waste in reeling.

The third section of the filature is responsible for the examination of the skeins. Gum marks and other minor defects are detected and removed, and the raw silk is then weighed, sized and cleaned in this section. Larger skeins are divided into smaller ones and are properly tied, graded and marked for commercial purposes.

The above account of the general management of a modern filature clearly indicates the economic value of the system of division of labour, and shows how internal economies are secured by a proper utilisation of the various factors in production. There are other important points, however, which must be considered from a broader industrial point of view, as the future of the reeling industry depends not only on the introduction of new mechanical and labour-saving appliances, but also on the quality and efficiency of the industrial organisation. One of the most important points worthy of notice in this organisation is the improvement of the sanitary and hygienic conditions in the filatures. The nature of the reeling profession is such as to render the physical condition of the workers unhealthy if the filatures

are not properly ventilated. For this reason it is highly desirable to remove the difficulties arising out of varying temperatures, strong smell and the effect of steam, by means of a better system of installation of the filatures.

As regards the supervision of labour it is essential that there should be a mutual co-operation between the employers and the employed. The enlargement of production will depend largely on the extent to which the interests of the workers are safeguarded. Under the present economic conditions in any silk-producing country it would be an unwise policy to ignore the material progress of the workers whose efficiency and productive capacities are closely related to their general prosperity.

The last but not the least important consideration in the organisation of the reeling industry is the regulated control of the supplies of cocoons. A country like Kashmir is happily placed in a position of great advantage owing to the production of a large quantity of cocoons within the country. The annual crop, in recent years, was in excess of the requirements of the filatures, and hence there was no danger of the plant lying idle. But in France, the difficulty was enhanced not only by the shortage of the native crop, but also by the complete stoppage of supplies from Asia Minor after the outbreak of the war. In these cases the buying departments of the filatures should be well organised so as to adequately meet the situation.

In the present section we have given a complete survey of the two independent forms of production, each of which leads to a definite system of organisation. The first form dealing with the organisation of the cocoon-producing industry is comparatively simple owing to the nature of its industrial operations. Its product is sold in a market which is neither complicated nor highly organised, and therefore from this point of view the industrial organisation corresponds to the commercial organisation. The second form is, however, entirely different from the first. Its product is the result of specialisation and more or less complicated organisation in so far as the industrial operations are concerned. Unlike the markets for cocoons the raw silk markets represent

wider interests and involve some difficult commercial problems. These problems are, perhaps, not so intricate as those of the cotton market, but still they are of sufficient importance to deserve an exhaustive inquiry. The main feature of the commercial side of the silk industry is that the market fluctuations are largely governed by the fickle disposition of the consumer, though under the present conditions a fair percentage of the total demand is represented by necessary commodities which do not respond to the vagaries of fashion. For this reason, before attempting to analyse the system of commercial organisation, we shall devote full attention to the utilisation of raw silk in its various aspects. There is, however, another important aspect of the silk-producing industry which we have not seriously examined so far. This aspect deals with the system of State control and bounties, and is a prime mover of success in certain countries. It is impossible to arrive at a conclusive judgment at a glance as to the relative merits of various forms of control, and therefore the best way would be to study the working of each method in order to determine its effect on the future of the industry.

This section might suitably be concluded with a chapter on the various forms of State measures adopted by governments in different countries to promote the interests of the silk-producing industry. In so far as the production of raw silk is concerned the concluding chapter may be regarded as the finishing phase of the present discussion.

CHAPTER XIII

STATE AND THE SILK-PRODUCING INDUSTRY

(a) SYSTEM OF BOUNTIES

It has been clearly observed in the historical review of the development of the silk industry that the State has always been an active agent in the promotion of sericultural interests of the various silk-producing countries. In ancient times the kings and the ruling classes of China and Japan earnestly participated in the task of fostering silk culture within their dominions, and by means of laws and enactments prohibited the exportation of the silkworm. The silk industry was then regarded as a national secret by the Far Eastern nations, and its absolute seclusion from the rest of the world was considered to be the only means of preserving its existence. But this state of industrial seclusion could only be retained for a certain period, after which the interests of the silk industry had to be safeguarded by other forms of State control. The gradual development in the means of communication and advancement in the spirit of international commercial intercourse helped towards the initiation of competition, and at last, when the silk-producing industry was no longer confined to the Far Eastern countries, various forms of State control had to be adopted by those countries which newly entered the arena of competition. In France and Italy, during the middle ages, substantial help was given by the ruling kings to encourage the production of raw silk, but the ultimate form taken by the State control was the granting of industrial subsidies and bounties. We shall now consider the system of bounties adopted by the French Government as an example to illustrate the economic importance of the principles underlying the attitude of the State towards the silk industry.

In so far as the payment of bounties is concerned, the

contributions by the French Government are divided into two parts. This division is based on the two principal aspects of the silk-producing industry in France. For a full realisation of the industrial objective, cocoon production is as important as the reeling branch of the industry and therefore any contribution towards the fulfilment of the first objective must be accompanied by a proportional contribution towards the development of the second. For this reason, bounties are paid, firstly, to the producers of cocoons, and secondly to the reeling establishments.

Let us first consider the action of the State with regard to the production of cocoons in France. In order to examine the present position in a lucid manner it will be necessary to refer to the various stages through which the system of bounties has passed.

A system of payment of bounties was first instituted by a law in January, 1892. According to this law the producers were granted a bounty of 50 centimes per kilo. of fresh cocoons by the State. In April, 1898, the rate of payment was raised to 60 centimes per kilo. of fresh cocoons. The actual terms of this law were to be in force till the year 1908 after which new amendments were to be introduced. In May, 1908, however, a further extension till May 31st, 1909 was granted by the Government. Again, in 1909 pressure was brought to bear on the Government to renew the bounties on more favourable terms to the producers for another period of twenty years, with a minimum rate. of 75 centimes per kilo. of fresh cocoons produced, instead of 60 centimes as before.

In June, 1909, the Silk-Producing and Reeling Bounties Law was revived for another twenty years at the old rate of 60¹ centimes per kilo of fresh cocoons produced. In various sericultural departments commissions were appointed to control the management of bounties paid to the rearers. Moreover, the Minister of Agriculture was given the charge of investigating the conditions of organisation and application of the above law with special reference to silk culture.²

¹ A little over 2½d. per lb.

² See *Journal Officiel*, du 13 juin 1909. It refers to Loi du 11 juin, 1909, "relative aux encouragements spéciaux à donner à la sériciculture et la filature de la soie."

It may also be mentioned here that under this law no maximum was set to the sums payable yearly by the State.

The reeling branch of the French silk industry enjoyed a similar privilege. In 1892 bounties were granted to the filatures for a period of six years and in 1898 they were revived for another ten years, till May 31st, 1908. In June, 1909, the Government finally decided to extend the system still further, and thus a law was passed by which the reeling industry was subsidised by the State for another twenty years.

From an economic point of view we have three distinct periods of evolution. Under the first *régime* the contribution made was proportional to the number of hours of work performed per basin. For every working hour the filature was allowed the following rates:—(a) 0.333 franc for a basin constructed for reeling two threads; (b) 1.333 franc for a basin constructed for reeling more than two threads; (c) 1.333 franc for an accessory¹ basin.

It may be remarked in passing that the basins constructed for reeling one thread were not subsidised at all, and the basins reeling double cocoons were paid special bounties. But as the number of the latter class of filatures was small, the system, as a whole, was regarded more or less uniform, and a final clause limited the amount of annual payment to 100 francs for a basin constructed for reeling two threads, and 400 francs for a basin constructed for reeling more than two threads or accessory basins. Another necessary condition was that basins were to be heated by steam and mechanical power was to be employed for purposes of driving the reeling wheels. In this law no mention was made of the quality of cocoons reeled, nor any restriction laid down as to the size of the raw silk. Above all, there was no maximum set to the daily or the annual production per basin.

A critical examination of the above system clearly shows its drawbacks. In the first place, the amount of subsidy paid to the filatures possessing basins for reeling three threads was the same as that paid to another establishment possessing

¹ Accessory basins are those basins in which cocoons are prepared before they are transferred to the actual reeling basin.

basins for reeling five or six threads. The system, therefore, did not afford special encouragement to the filatures using basins constructed for reeling more than three threads. Obviously greater attention was paid by the workers to the "running" of the basins and reels, than to the actual quality of the product. In the second place the filatures were not debarred from using lower qualities of cocoons and thus no impetus was given either to the efficiency of the worker or to the ambitions of the proprietor of the filature.

The period of the second *régime* commenced in 1898. The system of bounties was revived on a more or less similar basis with minor changes in the form of payment. The amount of bounty paid was still proportional to the number of hours of each working basin, the only difference being that the standard of the reeling basins was slightly raised by this law. The rates of payment were fixed as follows :—

(a) 0·1333 franc for a basin constructed for reeling more than three threads ;

(b) 0·1333 franc for every accessory basin used.

Another amendment introduced was the limitation of the sum payable to the filatures to 400 francs per annum per reeling basin or accessory basin for the reeling of cocoons of French origin, and to 340 francs per annum for foreign cocoons. Other conditions requiring the use of steam for heating purposes and mechanical power were the same as before.

As regards the necessary conditions defining the quantity of production, the law provided that the total amount of bounties paid quarterly should not exceed 6·50 francs per kilogramme of silk reeled during the quarter from indigenous cocoons and 5·50 francs per kilogramme of silk reeled from foreign cocoons.

The effect of this system was not very beneficial to the industry as a whole. In the first place, encouragement was obviously given to those reelers who used basins constructed for reeling more than three threads. The natural consequence was that most of the filatures adopted four-thread basins in order to touch the limit at which the bounty was payable. In the second place, those filatures which reeled

foreign cocoons were under a distinct disadvantage, as the amount payable to them for the same production was less than the subsidy offered to reelers of indigenous cocoons. But then there was another side of the question. The reelers of foreign cocoons, in order to receive the full amount of bounty (100 francs per kilo of raw silk per quarter) were necessarily required to raise their output so as to compete with the reelers of indigenous cocoons, and this in itself was an impetus to production.

M. Beauquis, while commenting on the utility of bounties expressly says that the system under the second *régime* did not lead to an increased production of raw silk in France.¹ His argument is based on the idea of minimum production. In order to have the right of obtaining 400 francs per annum fixed by the law, a filature could easily touch the point of minimum production. Let us take the concrete example of a filature endeavouring to obtain a bounty of 100 francs per basin during a working quarter. As the maximum limit fixed by the law was 6.50 per kilogramme of silk per quarter, the filature might just touch the limit at which the bounty was payable by producing $\frac{100}{6.50} = 15.385$ kilos of silk during

the quarter. Assuming the number of working days in the quarter to be seventy-five, production of raw silk per basin per day might reach 205 grammes. This was evidently a very meagre standard of production and the system afforded a considerable margin for the filatures to exploit the bounty without seeking to augment their output by improving the organisation or the reeling machinery.

Another argument given by the same author is based on comparative production of two filatures, the one producing 205 grammes of raw silk, and the other 410 grammes per basin per day. Even although the output of the one was double that of the other, they both received the same amount of bounty in cash as the maximum allowed per quarter was 100 francs. The first filature, in all probability, ignored the improvement of the reeling machinery and still received 6.50 francs per kilo. of raw silk, while the second not only

¹ " Histoire Économique de la Soie," p. 121.

raised the average output but also invested an extra amount of capital in the improvement of the plant, and, strictly speaking, received only half the amount. This situation was undoubtedly detrimental to the welfare of the reeling industry as a whole, and in so far as the system of bounties was designed to increase the annual yield of the filatures, its real objective was not attained even during the second *régime*.

However, there was one remarkable feature of the system which, if it had been established in practice, would have produced far-reaching results. It was the equitable treatment accorded to accessory basins in the filatures. An equal amount of bounty allowed to accessory basins undoubtedly resulted in a greater division of labour,¹ but the actual benefit derived from this division was never transferred to the workers, so that in so far as labour was concerned the system of bounties did not alter the previous situation.

The use of accessory basins for cleaning and beating the cocoons before the actual process of reeling, has, no doubt, added to the strength of organisation, which, during the period of transition, rested mainly on the division of labour. It has been remarked in a previous chapter that one of the principal features in the re-organisation of the reeling industry was the distribution of tasks which led to an increased output, and even if the system of bounties failed to realise its objective directly, it certainly helped towards a further distribution of tasks and thus encouraged production indirectly. Its effect may be clearly seen in some of the most modern filatures which have contrived to produce as much as 600 grammes, and even more, of raw silk of "classical" sizes.

Taking the reeling industry as an independent industrial group, it is impossible to maintain that the bounties have had any direct effect on the reeling machinery during the second *régime*. The only thing that may be said in favour of the system is that it gave a certain amount of encouragement to the daily output of the filatures.

The third, and, so far, the final *régime* commenced in 1909,

¹ This was accomplished by increasing the number of functions, in other words, by increasing the number of basins.

for a period of twenty years till May 31st, 1929.¹ The principal conditions of the former law were maintained in the new enactment, and the total amount of bounty payable was still fixed at 400 francs per annum per basin for raw silk reeled from French cocoons, and at 340 francs for raw silk reeled from foreign cocoons. There were, however, some minor alterations which greatly encouraged the use of six-thread basins. Moreover, the new law accorded a bounty of 400 francs per annum for the employment of the services of a *nouveuse* (knotter) or *rattacheuse* (end-thrower) to help the operations of a group of six-reeling basins, with the express condition that the basins were constructed for reeling six threads or more. The introduction of this new clause was certainly of great advantage to those filatures which were equipped with the most up-to-date machinery.

Another provision of the law passed in 1909 was designed to cause a general increase in the output of raw silk per basin. The maximum amount of bounty was fixed at 6.50 francs per kilo. of silk produced during the first four years of the application of the law, at 6 francs per kilo. during the next eight years, and at 5.50 francs per kilo. during the last eight years of the *régime*. According to the estimate given by M. Beauquis² the filatures will produce 205 grammes at least per basin per day to touch the bounty limit,³ with a maximum of 6.50 francs per kilo of raw silk. When the maximum is lowered to 6 francs and then to 5.50 francs per kilo the daily production of raw silk per basin would rise to 222 grammes and 242 grammes respectively at least, so as to enable the filatures to touch the bounty limit. It is obvious, therefore, that filatures with defective machinery and low output will be obliged to improve their plant in order to meet the competition in the reeling industry.

It may be noted here that according to the previous laws the workers did not derive any benefit from the bounties paid to the proprietors of the filatures, and, therefore, there

¹ See *Journal Officiel* of June 13th, 1909, for full terms of the law.

² See the previous reference on p. 160.

³ The expression "bounty limit," as used above, implies that limit of minimum production at which the reelers were entitled to a bounty.

was no direct effect of State help on the labour employed in the reeling industry. The State regulations did not provide the workers with an adequate safeguard against unemployment or accidental illness. But the new law passed in 1909 necessitated the establishment of a fund for the benefit of the workers by means of a "tax" of 6 per cent. on the total paid in bounties to the owners of filatures. The proceeds of this levy were to be divided every quarter among the workmen's mutual benefit societies *pro rata* to the expenses incurred by each on account of medical expenses, allowances during illness (with a maximum payment of 1 franc 20 cents. per day to any one member), lying-in expenses, funeral expenses, special help to minor orphans, and allowances at the rate of 60 cents. per diem for involuntary idleness.¹ This new condition was undoubtedly a forward step in the history of Silk Bounties in France, and in addition to its beneficial effects on production, it obviously created a new and a better situation for the workers in the filatures. The scheme was particularly appreciated by the reeling hands, because of its initiation in the new law and its complete absence in the previous regulations concerning the payment of bounties to the filatures. Ever since 1892, the workers were more or less excluded from the direct share of State help and, even although the Government expended nearly £160,000 annually on the reeling industry, there was no appreciable change in the material conditions of the workers.

As regards other advantages offered to the workers by State control, it is necessary to point out that reduction in the hours of labour has been quite independent of the modifications introduced in the Silk Bounties Bill from time to time. The hours of labour in the filatures have undoubtedly fallen from twelve per day before 1891, to eleven after 1891, and to ten since April, 1904, but this innovation was the result of a law which applied to all industries without exception. As already stated, no direct relation was ever established between bounties and the wages of labour in the

¹ *Cp. Diplomatic and Consular Reports, France, Annual Series, No. 4,483, Report for the year 1909.*

flatures, or in other words, the economic evolution of wages has been neither accelerated nor retarded by State control in France.

A close study of the system of bounties as adopted in France brings to light some very interesting economic features of the policy of the State with regard to the production of raw silk. The first aspect, dealing with the production of cocoons, has its individual characteristics and therefore needs a separate analysis.

In the first place, the principal object of granting subsidies to the silk-producing industry has always been to encourage the production of raw silk within the country in question, and to meet the demands of foreign competition in the open market. The second object has been to subsidise production to such an extent as to make it profitable to the producer, and also to give it an additional ¹ stimulus. Judged from an economic point of view, therefore, the two objects are closely related to each other, the first being an expression of the consumer's desire to obtain a ready and easy supply and the second being an expression of his efforts to help the producer to produce an adequate quantity or to maintain a definite supply of the desired commodity. The problem, though it seems quite simple at first, presents numerous difficulties when placed on a practical basis. A little economic reasoning makes it quite obvious that the commercially successful production of raw silk in France, for instance, depends not only on the vast economic resources available in the country, but also on the extent to which those resources put together can produce raw silk which can compete with similar raw silks produced in other countries and exported to France; for, in the face of facts, a manufacturer will consume only those silks which he can obtain at the most suitable prices. We have therefore to ascertain how far bounties counteract the effects of production in foreign countries on raw silk produced in our particular case and whether the bounties have produced the desired results.

¹ The giving of additional stimulus implies that the silk-producing industry will attract labour from some of the comparatively unprofitable branches of the agricultural industry.

The first part of the problem can only be solved by taking the "cost of production" into consideration. Let us take the example of a French rearer who obtains an average yield of about 50 kilos. of cocoons per ounce of seed. Assuming that the cost of producing 50 kilos. of cocoons is 120 francs, and the market price of fresh cocoons is 3 francs per kilo., the net returns then amount to 30 francs.¹ Under ordinary conditions a rearer therefore earns only 30 francs during the period which covers one complete rearing, that is thirty days or more. His daily income in this case does not rise above 1 franc, and he is thus inclined to regard cocoon production as a less remunerative occupation than others.

It is clear that there are only two alternatives left to the rearer ; either to raise the price of his cocoons to 3.50 francs per kilo. and obtain a net return of 55 francs, or to accept the market price ruling at the moment and thus earn only 30 francs. The former alternative is impossible, as it involves a general competition in the open market. If foreign cocoons of a similar quality are sold at 3 francs a kilo. in the Lyons market, the buyer is not likely to pay more than that for the French cocoons, and therefore, in so far as the market price is concerned, it is beyond the influence of the rearer to alter the existing conditions. But, on the other hand, the market price is detrimental to his monetary interests and a mere acceptance of it means a loss of half of his income. Under these circumstances he may make up his mind to abandon cocoon production, and may think of taking up a more remunerative occupation. The situation is, however, entirely changed when we take into account the influence of bounties on production.

Under the existing law, the French rearer is allowed a bounty of 60 cents. per kilo. of fresh cocoons produced. If he produces 50 kilos. of cocoons in one rearing he receives a bounty of 30 francs, which, when added to the sale price of cocoons, makes up a total of 180 francs. This leaves the rearer a margin of 60 francs, the cost of production being 120 francs, and represents his net earnings during a period of thirty days. The average earnings of a rearer in this case

¹ See the chapter on "Cost of Production" for further reference.

amount to 2 francs per day, a sum which was considered very fair for an agricultural worker in France before the war.

In the second part of the problem we have to ascertain how far the system of bounties has actually helped the production of cocoons in France. The answer to this question has already been given in the form of statistical evidence in another chapter. This evidence sufficiently indicates that the number of rearers has actually fallen from 125,244 in 1904 to 90,517 in 1913 (a decrease of nearly 50 per cent. in ten years). The quantity of cocoons harvested remained more or less stationary till the year 1909, after which it showed a considerable decline in 1910, and never recovered its former position even till 1913.¹ So far as we can judge from the results of the annual cocoon harvest, bounties have undoubtedly failed to realise the main objective, and the annual output has either remained stationary or declined. But, as the British Consul in Lyons remarks, "the only thing that can be said in favour of the bounty system is that, were it not for its lavish doles, the silk-growing industry would not even be in its present stationary condition, but would have steadily dwindled away year by year, under the influence of ever increasing imports of raw silk and cocoons (both of which enter France duty free) until it reached the vanishing point."²

There is a good deal of truth in the above remark. It is quite obvious from the practical case we have just examined, that the effect of foreign competition on French production is to lower the producer's profits to such an extent as to divert labour from the cocoon-producing industry to some other more remunerative industry. This transference would have completely deprived the silk-producing industry of its labour force had it not been checked by the influence of the bounty system; so that the bounties have not only raised the marginal profits of the rearers, but have also checked the outflow of labour. There are, however, people who maintain that an enormous sum amounting to about £200,000 a year

¹ Refer to the table on p. 131.

² Diplomatic and Consular Reports, France, Annual Series, No. 4,483, p. 13. Year 1910.

is a heavy price to pay for so slight an advantage, and that an industry which continually requires an artificial stimulus of this nature is not worth preserving. This is purely a national consideration, and cannot therefore be decided by the help of economic laws.

The application of the bounty system to the reeling industry also involves some practical difficulties. The principal object in this case, as in the case of cocoon-producing industry, is to increase the home production of raw silk. But as the reeling of raw silk is out of the agricultural domain, the State regulation of bounties and control is full of complexities and, therefore, the realisation of the objective is not so simple as it seems. The law governing the distribution of bounties to rearers is comparatively simple owing to the invariability of its application, but the various clauses of the law governing the grant of bounties to filatures are full of confusion, on account of the diversity of aspects which the reeling industry presents. First of all, the activities of the reeling industry have to undergo constant readjustments to meet new conditions of demand, and secondly, the industry as a whole, has to face the competition of those countries where production is facilitated by an abundant and adaptive supply of cheap labour.

The first of these difficulties is created by the varying demands of the market, and therefore the system of bounties should be designed in such a way as to perform two functions at the same time. A little reflection will show that the future prosperity of the reeling industry in any country depends not only on an increase in the daily output per basin, but also on an improvement in the quality of the raw silk produced. If production increases in a simple ratio while quality remains stationary, the danger of foreign competition becomes too imminent to be ignored. For this reason it is essential that bounties should perform their double function of raising the standard both of quantity and quality.

This object can be achieved by keeping the improvement of the reeling machinery in view. Any system of bounties designed to encourage the reeling industry should have as its

ideal the perfection of the reeling machinery. But, as we have seen during the course of our discussion on the various *régimes* of the French Bounties Law, the solution of the problem is not easy to seek. In the first place, the exact determination of the limit at which the bounty is payable requires careful consideration and constant readjustment. As soon as the limit is fixed the filatures, in most cases, endeavour to touch that limit and no more. This procedure inevitably results in an exploitation of the bounty and keeps production at a constant level during that *régime*. If the limit of production at which the bounty is payable is low, the owners of the filatures completely ignore the fundamental basis of success, that is, the gradual improvement of the reeling plant. It is necessary therefore that the minimum production should be fixed at a limit which acts as a strong incentive to the filatures, and results in an increased production of raw silk. Moreover, this limit should be readjusted at comparatively shorter periods (say three years), so as to take into account the increasing productive capacities of some of the filatures.

The second problem, which is of a greater industrial importance than the problem of output, and involves a far greater number of complexities, is the equalisation of the rates of bounties payable to filatures reeling different number of threads per basin. During the first *régime* in France, the limit was fixed at two threads or more, with the consequence that most of the filatures were equipped with basins constructed for reeling two threads. Under the 1898 *régime*, the limit was changed to more than three threads, and the results obtained were practically similar to those obtained during the first *régime*. The principal underlying the system is that the greater the number of threads a basin is constructed to reel, the greater is the amount of skill required for the manipulation of the thread, and, therefore, the wider the range of threads for which a bounty is payable, the greater is the incentive to the owners of the filatures to improve their plant and to introduce better reeling machinery. In order to secure best results, therefore, the system of bounties should cover as wide a range as is admitted by

existing conditions. The ultimate result of such a system would be a gradual improvement in the reeling machinery, without which it is impossible to meet the competition of the Far Eastern silks.

It is interesting to note here that the Italian reeling industry has made remarkable progress during the last twenty years, mainly on account of its incessant efforts to bring the reeling machinery to a stage of perfection. The Italian raw silks have established a "classical" position in the market even when competing with the Asia Minor and Chinese raw silks, which are produced under entirely different economic conditions. This successful rivalry on Italy's part confirms still further the argument that the future of the reeling industry and of its product in the world's market depends chiefly on the perfection of the reeling machinery.

Resuming our examination of the bounty system, we have yet to study the effects of the differential treatment accorded to home-grown cocoons. The original motive of this provision in the law was to encourage the production of cocoons in France. *Primâ facie*, no doubt, the provision should serve its purpose, but experience shows that in actual conditions of production this differential treatment fails to realise its object, for the simple reason that in the case of shortage of home-grown cocoons, the reelers are obliged to fall back on foreign cocoons. In some cases it has been noticed that it is a matter of "struggle for existence," and if the filatures are at all anxious to maintain their output they are obliged by circumstances to purchase foreign cocoons. Evidently, therefore, this differentiation practically amounts to an import duty on that part of the reelers' raw material which they derive from foreign sources, while, on the other hand, raw silk itself enters the market duty free. Taking the actual market conditions into consideration, it seems illogical to pay higher bounties on silk reeled from home-grown cocoons, as ultimately it becomes a tax on imported cocoons, without which the reeling industry cannot preserve its existence.

But, then, there is the other side of the question. Any measure adopted to abolish the system of differential treat-

ment would automatically withdraw a part of the protection enjoyed by the home producer, who would be confronted with an open competition on equal terms with the foreign producer and would thus be compelled to take up a defensive attitude. The only solution of the problem from the home producer's point of view, would then be a measure of compensation to the cocoon-producing industry, which would involve an increase in the existing rate of bounty paid to the rearer. But the adoption of this measure would depend mainly on the strength of the public funds, which might not be able to bear an additional yearly expenditure. However, in so far as the practical industrial interests are concerned, the system of differential treatment is obviously detrimental to the prosperity of the reeling industry, and therefore an additional protection to the home cocoon-producing industry, by means of an increase in the rate of the present subsidy, appears to be the best solution of the problem of foreign competition.

So far we have examined the system of bounties adopted by the French Government, and also the general principles on which it is based. It is needless to encumber the present chapter with rules and regulations governing the grant of subsidies to the silk-producing industry in various other countries, but, for purposes of comparison, it would be of interest to refer briefly to the form of State control adopted by the Austrian Government in 1904, to encourage the production of raw silk in Southern Tyrol, and in the territory of Görz and Gradiska. The original motive which prompted this consideration is expressed in the Order of the Austrian Minister of Commerce, dated June 24th, 1904,¹ in the following terms :—

“ Considering the unfavourable economic conditions of silk reeling in Southern Tyrol and in the districts of Görz and Gradiska, and with a view to improving the position of the women in this industry this Ministry, in concert with the Ministers of the Interior, and of Finance, conditional on the constitutional approval of the necessary funds, devotes the

¹ Quoted from “ The Silk Industry in India,” Vol. III., Lefroy, p. 215.

sum of 150,000 Kronen¹ per annum for five years for the granting of subsidies."

The conditions under which these subsidies were granted to individual reelers, subject to subsequent modification, are contained in the following articles :—

" *Article 1.*—The subsidies will be granted according to the number of basins at work, at the rate of 12·5 cents² for every basin and for every quarter of a days' work up to a yearly maximum amount of 120 Kronen per basin.

" In granting these subsidies, other conditions being equal preference will be given to those basins tended by women belonging to the same silk district.

" As the whole subsidy may not exceed 150,000 Kronen, if applications by reelers entitled to receive subsidies should be so numerous as not to allow all of them being granted, preference will be given to those which were recently working.

" Reelers in receipt of subsidies are bound for the whole season of production to conform to the present regulations, also in the event of their output being above the quantity which entitles them to the maximum yearly subsidy.

" *Article 2.*—Only those factories which conform to the provisions of the industrial regulations, and are in a condition to work in all seasons may claim subsidies.

" *Article 3.*—Only basins heated by steam and provided with mechanical reels constructed for reeling four or more threads and assisted by stirrers may be subsidised.

" *Article 4.*—Basins constructed for reeling four or more threads will be subsidised even if they reel less than four threads, provided the weight per unit length reeled be above 16 denari (one denaro corresponds to 0·05 gram per length of 450 metres).

" *Article 5.*—Every subsidised basin must be served by a woman who must not be employed at another basin.

" *Article 6.*—The subsidy will be granted only to those basins which work at least 150 whole days per annum during the first three years, and at least 180 whole days in the following years.

¹ Kronen = 10 pence,

² Cent = $\frac{1}{100}$ th of a penny.

"Article 7.—Reelers in receipt of subsidies engage to adopt the following minimum scale of wages :—

"(a) Head reelers, 10 cents per hour.

"(b) Sub-reelers, 9 cents per hour.

"(c) Experienced stirrers and apprentice reelers 8 cents per hour.

"(d) Young stirrers, 7 cents per hour.

"(e) Apprentices during the first year, 6 cents per hour.

"(f) Beginners during the first six months, 5 cents per hour.

As a rule no workwoman may remain more than one year in any of the four classes (b) to (e).

"Reelers must keep to the maximum of 11 hours work per day as fixed by the industrial regulations for factory work."

Other articles of the above Order relate to the administration of the scheme, and are not of much importance from an economic point of view. It is, however, important to note here that the first paragraph of Article 1 was slightly modified in 1905. The rate of subsidy was reduced from 12.5 cents to 11.5 cents for every basin, but the yearly maximum amount was raised from 120 Kronen to 135 Kronen per basin.

The system of bounties adopted by the Austrian Government, as given above, presents some very interesting features. In common with the French system it adheres to the principle of fixing a yearly maximum limit, though the limit is obviously lower than the one allowed in France. There are, however, no differential rates in this case, and the absence of this provision shows that either the Austrian reeling industry depends largely on imported cocoons, or the home cocoon-producing industry, if of any importance, receives help in some other form.

The second point worthy of notice is that preference is given to those basins which are tended by women belonging to the same silk district. This clause not only checks the inflow of labour from other districts, but also encourages the employment of local labour within a particular locality.

The third feature which affords a wider range of activity to the filatures is by no means less important. Although the filatures must be equipped with basins constructed for reeling

four or more threads, yet a subsidy is allowed even if less than four threads are reeled, provided the weight per unit length reeled is above 16 denari. The true interpretation of this clause can be reduced to the simple fact that the reelers can pay equal attention both to the quantity and the quality of the raw silk produced ; for, in order to increase the output per basin they must reel more than four threads, and, in order to devote greater attention to certain finer qualities of raw silk than to others, they may reel less than four threads with the same basin.

The fourth distinguishing feature of the Austrian system of bounties is the State control of wages, which not only regulates the scale of wages per hour, but also defines the period of apprenticeship. It may be noted that the highest wage allowed in the reeling factories does not even amount to a shilling a day, calculated at the rate of one penny an hour. This scale is much lower than the ordinary scale of the French filatures, but owing to a difference in the economic conditions of the two countries, perhaps, the rate is quite acceptable by the workers. The period of apprenticeship may extend over one year but no more, so that after a year's training as an assistant, a worker may claim full wages. This limit, however, does not exclude those workers who acquire full efficiency in less than a year from claiming their just demands. This clause expressly denotes that, under ordinary conditions, a workman must acquire the required standard of efficiency within a year's time, and therefore, in addition to its being an active agent in determining the period of apprenticeship, it serves as a means of grading labour in the filatures.

It is, perhaps, apparently beyond the scope of the present discussion to dwell on the various other aspects of State help in promoting the interests of the silk-producing industry, but as an example leading to elucidation of facts, it may not be without interest to mention here that the French Government have, from time to time, granted substantial sums of money for the purpose of encouraging experiments in silk production on scientific lines. As recently as 1913, a Government grant of 50,000 francs (£2,000) a year was voted by Parliament in addition to the existing bounties, for the

organisation of competitions, the furtherance of experiments and research work at the Montpellier National School of Agriculture, and the gratis distribution of mulberry trees and silkworms.¹

The distribution of public funds for purposes of industrial development is undoubtedly a matter of great responsibility, and, therefore, it may be safely presumed that the production of raw silk is regarded as a national industry in France and other countries where grants and subsidies are freely given to the producers. Strictly speaking, the spirit of State help is based on the fundamental assumption (which is also a matter of fact) of competition between Europe and the Far East. Those economic factors which are of vital importance in the production of raw silk exhibit different features in different countries. Although the efficiency of labour in the European countries is greater than in China or other silk-producing countries in the East, the abundant supply and the low price of labour in the latter case counterbalances the advantage gained through efficiency in the former case. The ultimate result of the difference in economic conditions is that the Eastern raw silks, owing to a lower cost of production, enter the world market fully prepared to meet any competition. While formerly their quality was somewhat inferior to those of European origin, in recent times, even that drawback has gradually disappeared, so that at present competition in the open market rests both on quality and on price.

Under the stress of circumstances arising out of competition two alternatives seem practical. The first is to lower the cost of production by constantly improving the reeling machinery in such a way as to neutralise the effect of foreign competition, and the second is to adopt the policy of artificially encouraging the industry by means of bounties and other forms of State help. But, as we have seen already, both these alternatives can be reduced into one by devising a proper scheme of bounties which, while serving its function of direct encouragement, may also serve as an active agent in

¹ Diplomatic and Consular Reports, France, Annual Series, No. 5,324, 1914, p. 11.

the re-organisation of the filatures. Experience of the past fully testifies to the view that State help is almost a necessity in the European and other prospective silk-producing countries, and if this is the case, any system of bounties, designed to preserve or to prolong the life of the silk-producing industry, should aim not only at an increase in the amount of production, but also at a constant improvement in the arts and means of production.

We have now come to a stage where it is advisable to divert to another channel of the present discussion. So far we have been examining the relations of the State to the silk-producing industry in a more or less limited form, and have been paying attention to that aspect of the subject only which deals with the generous attitude of the State towards the welfare and general development of the silk industry. But in addition to this aspect, there is another form of State control, which begins with the object of industrial development and finally turns into a complete State monopoly. This is, undoubtedly, an exclusive aspect in so far as the silk-producing industry is concerned, and is therefore represented by exclusive instances; but it has its individual features which are full of economic interest. The Kashmir silk-industry, which is a complete State monopoly, presents a very interesting instance of the monopolistic power of the State and its effects on production. We shall now proceed to examine the nature of this monopoly, and its influence on the economic conditions prevailing in the silk industry.

(b) STATE MONOPOLY

Under the bounty system, which has been fully discussed in the last chapter, the State exercises a partial control over the industrial organisation and introduces legislation to put into effect the various provisions of the law relating to the welfare of the silk industry. But it will be noticed that the commercial organisation is beyond the province of State control, and in so far as stocks, sales and purchases are concerned, the State does not interfere in the working of the commercial mechanism. In short, the bounty system involves a partial State-control, which may be expected in

any industry whatever receiving contributions from the public funds.

The Kashmir silk industry is governed by entirely different economic laws. It has been indicated in a previous chapter that in the late " 'sixties," when the spirit of industrialism commenced its active operations in Kashmir, the State participated in the task of industrial regeneration with a view to developing the economic resources of the country. A knowledge of the past conditions showed that the production of raw silk on a commercial scale was within the limit of industrial success, and fully realising the value of this enterprise, the State undertook the organisation of the silk industry. By 1891, the Kashmir silk industry became an established State monopoly and, since that period, it has been working out its destiny under a form of central organisation directly controlled by the State authorities.

Before proceeding to study the economic aspects of this monopoly, it would be illuminating to explain the present conditions of the system under which the Kashmir silk industry follows its activities. Being a complete State monopoly, from the production of the seed to the sale of the raw silk, it is an exclusive instance in the recent history of silk production and is, for that very reason, an interesting economic study.

The first important point that enters into our discussion is the unlimited powers of the State to obtain possession of the various factors in production. The mulberry trees which form the backbone of the cocoon-producing industry are the exclusive property of the State in Kashmir. "All cutting of mulberry trees, or branches thereof, is a criminal offence, unless done under the authority of the Inspector of Mulberry Culture."¹ This regulation prohibits not only the private possession, but also the private disposal of mulberry trees standing in private grounds. In this way the State exercises a complete control over one of the most important factors in production, and thereby secures an advantage which would be practically inaccessible to a private monopolist.

¹ "Rules and Regulations regarding Protection of Mulberry Trees in Kashmir." See Lefroy, Vol. III., p. 39.

The next important factor in production, that is, an abundance of cheap agricultural labour, presents the least amount of difficulty in Kashmir. The State authorities exercise full powers over the organisation of labour and can, at any time command an adequate force to supply the needs of the silk industry. It might be argued that this kind of labour organisation involves forced control, and is therefore, in principle, contradictory to the laws of free development of industry ; but, as will be explained later, it has certain advantages which counterbalance its drawbacks.

As the two important factors in production are controlled and organised by the State, and as the seed is distributed free to the rearers, it follows naturally that the produce of the industry is the property of the State. No individual rearer is allowed to sell cocoons on his own account. The entire harvest of cocoons is received by the department at a central establishment and is then forwarded to the filatures where it is converted into raw silk. The sale of raw silk is also conducted by the State and private individuals are excluded from taking part in any of the transactions relating to the silk-producing industry. The following rules clearly explain the provisions of the law governing the possession of cocoons and raw silk :—

“Whereas it is expedient to provide a law against the unauthorised sale or possession of silk cocoons and seed and the unauthorised possession or receiving of raw Kashmir silk, it is hereby enacted as follows :—¹

“(1) This regulation shall be called the Kashmir Silk Protection Regulation of 1963 (1906-07) and shall extend to the whole of the Jammu and Kashmir State.

“(2) The words (1) ‘kirm kash,’² (2) silk seed, (3) silk cocoons and raw Kashmir silk shall have the meanings ordinarily attached to these terms in the Jammu and Kashmir State.

¹ Rules regarding unauthorised possession of cocoons, etc., sanctioned by the Durbar and published in *State Gazette*, No. 27, dated October 14th, 1907 ; also given in Lefroy, “Silk Industry in India,” Vol. III., p. 40.

² Literally the word “kirm kash” means a “worm killer,” but here it is used for a “rearer.”

“(3) Any ‘kirm kash’ employed by the Sericulture Department, Kashmir, who disposes of by sale or otherwise in favour of any person, except the Director of Sericulture, Kashmir, or such persons as may be appointed by the said Director in this behalf, any silk cocoons reared by him and in his possession or any silk seed given to him for rearing by the said Director, or who wilfully neglects to deliver up the full quantity of silk cocoons reared by him ; or to make over, if required to do so, any silk seed in his possession to the said Director of Sericulture or the persons appointed by him in his behalf shall, on conviction, be liable to imprisonment of either description for a term which may extend to three years or to a fine or to both.

“(4) Any person who, without any authority from the Director of Sericulture in this behalf, receives in any manner whatsoever, any silk cocoon or any silk seed from any kirm kash or is found in possession of any silk cocoon or seed otherwise than under the authority of the Director of Sericulture or any other person or persons duly authorised by him in this behalf, shall be dealt with as if he had dishonestly received stolen property knowing or having reason to believe the same to be such, and shall be liable to be prosecuted under section 311, Ranbir Dand Bidhi.

“(5) Any person who receives or is found in possession of raw silk manufactured from cocoons reared under the authority of the Kashmir Sericulture Department otherwise than with the permission or under the authority of the Director or other person duly authorised by him in this behalf shall, on conviction, be liable to imprisonment of either description for a term which may extend to three years or to fine or to both.”

The nature of the regulations given above clearly indicates that it is impossible for rearers and reelers to possess or to dispose of cocoons or raw silk except under severe penalties. The limit of the State control does not terminate here, as the export trade in raw silk is also carried on by the Kashmir Sericulture Department. The State therefore holds a monopoly not only of the production, but also of the sale of cocoons and raw silk. Still further, the waste silk (which

may be regarded as a by-product) is also disposed of by the State. There is thus a complete centralisation of industrial and commercial control combined with the State ownership of appliances of production.

It is misleading to pass a judgment on the defects or merits of this system without reference to the ultimate results, and to the circumstances that led to the adoption of this policy. The true spirit of economic study demands an impartial analysis of the system of State monopoly as applied to the Kashmir silk industry, and for this reason it is necessary to examine the arguments that might be given by two opposing parties. It may be remarked before proceeding to a general discussion that some arguments involve pure political controversy and relate to matters of expediency. These arguments will be left aside for the present and only those points will be touched which exhibit purely economic features.

One of the principal arguments strenuously put forward by the advocates of private enterprise is that, the State control invariably destroys initiative among the producers. This argument may be justly applied to some industries under specific circumstances, but it has no significance with regard to the Kashmir silk industry. It will be remembered that prior to the State interference, the silk industry in Kashmir was scattered all over the valley with no organisation to bind the various branches of the industry together. Judged from the modern point of view, there was no awakening of economic activity and initiative on the part of the agricultural population, and with the exception of irregular sales in small towns there was no organised market for raw silk. The absence of this initiative on the part of the actual producers clearly shows that if it was ever desired to develop the Kashmir silk industry on a commercial basis, there were only two possibilities of action. The first was the transference of the entire control to the State with an unlimited ownership of appliances of production, and the second was the possibility of leasing certain "concessions" to a private firm for a certain number of years. The first form of control was ultimately made the basis of the present Kashmir silk industry. It is not difficult to see that even if the industry

were handed over to private promoters, the control would have assumed the form of a monopoly, as, in order to utilise the natural resources of the country in the production of raw silk it was necessary to exercise complete control over the various factors of production. In that case, therefore, the difference would have been only of form and not of principle, and in the long run the initiative of the producers would have suffered as much from private monopoly as from State control.

Let us assume for the sake of argument that it was contemplated to establish a private monopoly in Kashmir to undertake the development of the silk industry and the State was asked to accept a certain share of the profits of production. Before the actual commencement of the sericultural operations how would it be possible to assign the share of profits to be given to the State for certain industrial "concessions"? On account of the uncertainty of development the returns would either be over-estimated or under-estimated. In the former case, the share of the State would become a sort of heavy tax on production and the business of the private monopoly would be hampered; and in the latter, the State would receive a proportionately less return. In these circumstances friction might arise between the interests of the State and those of the private monopoly, and thus might endanger the very existence of the silk industry. It is obvious therefore that in the first stage of development it was necessary for the State to exercise full control over the organisation of the silk industry. As the prospects of success became brighter every year and as the industry began to show profits, the State monopoly became more or less permanently established.

Closely connected with the above argument is another consideration which refers to the self-interest of the producers and is often put forward as a reason against the State control of industry. It is held that the producer, in a state of free exchange, can obtain a greater remuneration for his labour than what he receives from the State in the form of standard wages. But the point at issue is whether such a state of free exchange is possible in the case of the Kashmir silk industry.

It has been argued in the last paragraph that in the absence of a State monopoly the industry would ultimately assume the form of a private monopoly, and if this is so, the rearer and the reeler would be under the influence of exactly similar economic laws. It must be remembered throughout the present discussion that under the existing economic conditions in Kashmir, organisation of the silk industry on a large scale necessitates some form of monopoly, and therefore the very idea of a system of control excludes the possibility of a free exchange. This is undoubtedly a great drawback from the producers' point of view, as it excludes him from a share in the increased profits of the industry caused by a sudden rise in prices. But, on the other hand, a fall in prices and a consequent reduction in profits do not materially alter his position as the rate of remuneration fixed by the State remains constant even during the period of commercial depression.

The position is, however, different when the industry is a private monopoly. The monopolist in this case may appropriate the whole amount of extra profits resulting from a favourable change in the market conditions, and may not distribute a proportional share of his gains among the workers. If, under these circumstances, the State derived extra profits and did not distribute a proper share among the workers, the result would not be harmful to the community as a whole, as the extra addition to the revenue would be ultimately devoted to some form of public expenditure, and would perhaps, withdraw a part of public taxation. As a matter of fact the Kashmir State has already added a considerable sum to the annual revenue on account of the increasing profits in the silk industry and if even a part of the additional revenue be spent in improving the material welfare of the silk workers, the State, as a whole, will benefit by better conditions in the field of industrial activity.

On the other hand, if the private monopolist were to sustain a temporary loss in the enterprise, the possibility of industrial recuperation would be remote, and in all probability the industry might be abandoned for ever. In the case of State monopoly, however, it might be possible to

renew the efforts with increased vigour in order to minimise the chances of risk, and to re-establish the former position.

It seems desirable therefore from the point of view of distribution of wealth and also from the industrial standpoint, that the Kashmir silk industry should continue its operations under the State monopoly so long as the agricultural communities are not out of their narrow sphere of economic activity. The present form of monopoly first of all directly helps the producer by opening new channels of labour for him,¹ and secondly, it affords him indirect help by adding to the useful revenue of the State. Above all it prevents the undue exploitation of the natural resources of the country by a private monopolist.

Another favourite argument given against the complete State control of the silk industry is that the work of organisation is done by officials who, even with the best of motives and with the most effective supervision, can possess only a part of the stimulus to industry that the private monopolist feels. But in this argument the fundamental position of the actual control is completely ignored. The industrial operations are directed by a Director of Sericulture appointed by the State, whose sole business is to study the interests of the silk industry in every detail and to show by practical results the amount of progress made within a definite period. In this respect, therefore, the functions of the director appointed by the State are identical with those of an official appointed by the private monopolists, as, in the long run, the real stimulus to energetic industry in both cases lies in their desire for promotion which they can receive only by showing satisfactory results. There is no doubt that in some cases the subordinate officers do not show the requisite amount of interest in the progress of the industry, but then the same may be said of hired labour used by private monopolists.

It may be pointed out in connection with the above argument that the State monopoly of the silk industry in

¹ The above statement involves the assumption that the silk industry is more profitable than other branches of agriculture practised in Kashmir. The policy of the State to force labour in the beginning was to make the workers realise that the production of silk was more profitable than the production of rice.

Kashmir has reduced the cost of production of cocoons owing to the utilisation of the services of all the available officers in the State during the period of seed distribution, or for purposes of performing accessory functions relating to the organisation of the industry. This is especially true of services which are not of a technical nature, but which do require an increase in the staff and whose burden ultimately falls on the cost of production. Under a private monopoly, these services would have to be paid for and would thus have to be included in the charges for organisation and finally, in the cost of production. It is obvious, therefore, that under this form of State control the cost of production is reduced in proportion to the efficiency of organisation and to the utilisation of services which are already paid for in some other department of the State.

In addition to the arguments against the State monopoly stated above, some commercial experts have repeatedly maintained that the complete State control of industry lacks industrial enterprise, and that owing to the absence of "freedom of action," the State cannot conduct the industrial operations like mercantile firms with experience of actual conditions of production. They further hold that, as private firms invest large amounts of capital at their own risk they are more likely to use their utmost energies in the industry than the State which is, as a rule, responsible for multifarious interests. The validity of this argument, as has been pointed out before, depends entirely on the nature of the industrial organisation set up by the State. In the case of the Kashmir silk industry, for instance, the Department of Sericulture is highly specialised, and therefore it cannot be argued that any private company would pay more attention to the development of the silk industry than the State Department whose entire business is to organise the available factors of production in such a way as to achieve the best possible results. There is no doubt that the governmental control involves certain administrative complications which, in some cases, retard the progress of the industry owing to the various sanctions which have to be obtained before a particular measure can be adopted ; but much of

this "red tape" can be easily avoided by conferring certain discretionary powers on able and experienced officers. There have been cases which indicate that owing to a long delay in the sanction of necessary funds for the improvement of machinery, the commodity produced was defective and consequently its value was lessened by 10 to 19 per cent., but this only shows that the departmental control needed improvement, and that there was further room for "freedom of action." If the officer in charge of the industry fully realises the responsibilities of his position and proves by practical results that he is capable of having discretionary powers, he is certainly like the manager in a private company, who can, in certain cases, take immediate steps before referring the matter to the board of directors. "Freedom of action," therefore, in both cases depends firstly, on the nature of the organisation and secondly, on the organising abilities of the head of the department, as neither a State nor a private company would confer unlimited powers on those officers whose record of service does not command full trust.

Reviewing the present situation of the Kashmir silk industry with special reference to the origin of the State monopoly from an economic point of view, we are confronted with a number of valid arguments for governmental interference. First of all, the existing economic conditions in Kashmir demanded the organisation of the cocoon-producing and reeling industries on a very large scale under a system of single central control, and in order to ensure the future success of the silk industry as a whole, it was obviously most expedient to prevent all private persons from bringing the produce into the market or even from producing the commodity on their own account. This system of control was the very foundation of the State monopoly, and if it were left to a private monopolist to undertake the development of the silk industry, then either some utilities would not have been provided at all or would have been more expensive or inferior in quality. Under these circumstances the development or even the resuscitation of the industry would have been an arduous task full of industrial and commercial difficulties.

Secondly, the investment of capital in the "silk enterprise" presented great risks in the commencement of the period of industrial regeneration, and naturally the question of the present outlay for remote results was not one which could be solved easily. The private individuals had neither the requisite amount of capital nor sufficient stamina to run the risks of the enterprise, and therefore it was left to the State to undertake the task of developing the silk industry on commercial lines. Again, a similar procedure of control was inevitable, and in order to safeguard the interests of the capital invested by the State it was undesirable to allow private individuals or joint stock companies to enter into competition with the State agency, with the result that a State monopoly of the silk industry was properly established.

Another factor which enters into the present discussion is that of foreign competition. In a modern silk market uniformity of quality is one of the most essential requirements of the silk trade, and if this condition is ignored in a certain kind of raw silk, the consequence is a fall in the price of that particular quality. It has been explained in a previous chapter that uniformity in the quality of raw silk depends not only on the efficiency and skill of the reeler, but also on the nature of the supervision in a filature; so that in order to produce large quantities of uniform raw silk it is essential to organise production under a central control. This kind of organisation did not exist before the Kashmir State launched its great monopoly and in a state of "private enterprise," it was practically impossible to achieve that uniformity of action which enables the produce of the silk industry to enter into a successful competition with similar produce from other countries. It is therefore quite obvious that the market demands necessitated production under a central control, and the system of State monopoly in Kashmir added to the commercial success of the Kashmir raw silks which did not fail to attract attention in the European silk market.

Broadly speaking, the State monopoly has succeeded in producing a utility by a combination of the capital, the labour and the economic resources of the country, and has

thereby added to the annual dividend of the State. It has, moreover, led to the creation of favourable working conditions in the silk industry and has, above all, imparted an industrial stimulus to the agricultural classes in small towns and villages. In short, the State has increased the individual and collective opportunities by bringing together the various factors in production and by introducing the element of harmony in the silk-producing industry.

We have so far dealt with the system and the principles involved in private monopoly and complete State control of the silk industry with reference to the methods adopted in Kashmir. Let us now divert our attention to the aspect of private enterprise in the production of cocoons and raw silk as compared with the system of State monopoly. This aspect evidently involves the assumption that the silk industry in Kashmir is left entirely to individual producers, and that the State does not interfere with the industrial or commercial activities of the producers.

There are two possible consequences which may react on production in this case. In a country like Kashmir where the agricultural and commercial communities are not organised on a basis of co-operation, firstly, there is a great danger of over-production, especially when nature offers her generosity unhesitatingly. The rearers, as a rule, are absolutely unaware of the distant markets, and if, under conditions of private enterprise, they are entitled to conduct independent sales, there is every likelihood that they will be unduly exploited by the cocoon agents. Their inability to anticipate demand will lead to over-production, and owing to a lack of organisation the commission agents or other buyers of cocoons will take undue advantage of the situation. It has been remarked before that in Kashmir, even under present conditions of State monopoly, the harvest of cocoons has been in excess of the requirements of the filatures in recent years. If the industry were left to private enterprise, an over-production of this nature would cause an immediate reaction on demand, and prices would consequently fall below the line of marginal cost. The State authorities are, however, in a strong position as regards over-production on

account of the facilities offered by a regular export trade in cocoons to Italy and France, and the danger is thus wholly averted by means of economic foresight.¹

It will be interesting to note here that the danger of over-production is, strictly speaking, a limited factor which might react on demand and prices within the Kashmir State, under conditions of private enterprise. When the production of cocoons is considered from the point of view of the world's market, over-production does not exist at all, as there is always an unlimited demand for cocoons in the Marseilles and Milan markets. If the producers in Kashmir had the independent means of disposing of their goods in foreign markets, there is no doubt that the question of over-production (referred to in the last paragraph) would not arise; but as the mechanism of exchange operates only within limited areas in Kashmir, the question of over-production does arise and the State monopoly is the only force which neutralises the effects of production in excess of the current demand.

The second possible consequence of private enterprise in Kashmir is closely connected with the one given above. The importance to each individual of finding buyers of his commodity naturally leads to a further waste of material and involves additional charges of the commission agents. If the commission for selling is paid by the producer, it adds to the cost of production; while, on the other hand, if the commission or the brokerage is paid by the filatures or by the exporters, the delivery price of the commodity is raised in proportion to the amount of charges paid for these services. These intermediary charges are reduced to a great extent by the action of the State in holding the monopoly of both the production and the distribution. While considering the ultimate success of the Kashmir raw silks in the European markets, it must be remembered that the competition with the Far Eastern silks demands a scale of delivery prices which cannot admit of too many intermediate charges, and, therefore, from the point of view of foreign competition also,

¹ Perhaps the surplus in the case of over-production could be exported without State aid, but in that case the undue exploitation by the dealer and the middleman could not be easily checked.

it is necessary that the commercial transactions should be conducted in such a way as to involve the minimum number of agents of exchange. This can be accomplished only under the present system of control in Kashmir, and even if the silk-producing industry were left to private enterprise, the commercial success of its produce would depend on a reduction in the number of functions of distribution, a feature which is the keynote of the State organisation.

One peculiar consequence of the State monopoly is the appearance of an irresistible temptation on the part of the rearer to sell his cocoons to buyers outside the Kashmir territory. This is due chiefly to the geographical situation of the State and is observed only among the rearers who practise sericulture on the border lands between northern India and the Jammu territory. The Punjabi buyers offer higher prices for the cocoons than those offered by the State, with the results that the rearers are tempted to sell their commodity to unauthorised persons and thereby expose themselves to the terms of the law which strictly forbids private sales of this kind. The presence of this temptation leads us to conclude that, under the State monopoly, the prices of cocoons (in this case the returns to labour) are determined simply by the arbitrary rules adopted by the State, without considering the inter-relations of supply, demand and prices. The very fact that there is a higher offer from an outside buyer, is in itself a sufficient evidence to indicate that the rearers could make larger profits if they were allowed to sell their cocoons to the prospective customers.

But the above conclusion is misleading in one respect. It does not take into account a very important item in the cost of production, that is, the price paid for the seed, which under the State monopoly is distributed free of charge among the rearers. When we include this item in the cost of production under conditions of private enterprise, we at once find that the offer from the outside buyer is not much higher than the price paid for the individual output of cocoons by the State, as, in the latter case, the price of the seed must be added to that of cocoons in order to determine the actual cost of production. Moreover, the State bears the cost of supervi-

sion and inspection of the seed before it is given to the rearers, which further shows that even in the case of a higher offer from an outside buyer the rearer is not justified in selling his cocoons in this manner, and that the prices paid by the State are not lower than those a rearer would obtain under conditions of private enterprise.

Before concluding the analysis of the State monopoly in Kashmir it would be interesting to refer briefly to the problem of wages under the two systems of control discussed in the present chapter. It has been shown already that the cocoon-producing industry remains more or less unaffected by a rise or fall in the prices of raw silk owing to its economic resemblance to agriculture. But the reeling industry exhibits different characteristics. In Kashmir, there is no combination of workers and reelers in the filatures and the wages are determined by the State regulations which, as has been shown, take into account the efficiency of the worker in all cases. The scale of wages is very low as compared with that of the European reeling industries, but on account of different economic conditions the reelers do not seem to agitate against the present system. The future problem, however, remains unsolved if we were to regard the situation as permanently stable, and in order to study the effects of monopoly on labour, we are naturally inclined to ask if there would be a rise in the wages of the filature hands owing to a rise in the price of raw silk, under conditions of monopoly, whether private or governmental.

The answer to the question needs a little reflection. First of all a rise in the price of raw silk through intensification of the demand would result in an additional inducement for the employer to cause an extension of the reeling factories whether the monopoly is held by the State or by a private body. Secondly, steady market prices and increased profits to the reelers, due to a fall in the cost of production, would also tend to cause an extension of business under any system. It is therefore logical to assume that an extension of the reeling factories would tend to cause an intensified demand for the appropriate labour, and ultimately there would be a rise in wages (provided, under the State monopoly, the State

does not exercise its prerogative right of forcing the labourer to work in the filatures under any conditions whatever). The ultimate rise in wages may therefore be expected in those cases even if there were no trades union of the labourers ; since the employer would be very anxious to utilise the opportunity of increasing profits. Whether the rise in wages would be permanent or temporary depends entirely on the duration of the period during which these changes take place, and also on other economic conditions which bring about a general rise in wages.

The view expressed in the last paragraph represents the theoretical influence of a rise in prices on wages, but in Eastern countries the theory does not readily assume a practical form, and the conditions prevailing in the Kashmir reeling industry sufficiently indicate the accuracy of this suggestion. As a rule, a rise in wages takes place very slowly in a country like Kashmir, as other economic conditions also do not undergo rapid changes, and for this reason it is necessary to withhold judgment at the present moment. It is, however, only just to say that the State monopoly of the silk industry in Kashmir has contributed a good deal to the economic welfare of the agricultural classes and by a system of central control it has imparted a new life to the silk-producing industry which was practically extinct at the time when the State came to its rescue.

At this stage of our discussion it might be asked if the Indian silk industry could be revived on lines similar to those followed in Kashmir. The answer to this question is not free from the usual complexity present in all questions relating to the Indian industries. It must be remembered that the economic conditions governing the production of raw silk in Kashmir are entirely different from those existing in India and therefore it is unpractical to apply the system of State monopoly to the Indian silk industry. The ultimate success of any system of control depends on the quality of the economic factors surrounding the industry, and if the quality of these factors is poor, it is simply an undue optimism to expect good results from them. The same may be said of the application of the system of State monopoly in India

as regards the production of silk. The difficulties presented in this case involve questions of industrial organisation, and it is only by means of a very careful analysis of the situation that one can expect to obtain satisfactory results. We shall examine here those distinguishing features of the Indian silk industry which disqualify it for the system of control adopted by the Kashmir State.

At the very threshold of inquiry we find that the Indian silk-producing industry is scattered all over the country with an uneven distribution in distant provinces of the vast Indian continent. This feature of the industry makes organisation on a system of central control not only very expensive, but also extremely difficult. In Kashmir the area of control is comparatively limited, and on account of its concentration within the boundaries of the State, it is not difficult to organise the silk industry under a single central control. In India, on the other hand, the organisation of the industry on the lines followed in Kashmir would involve enormous sums of money and would be a heavy drain on the Government treasury. In addition to the financial burden, difficulties of administration would also crop up during the period of reconstruction, which might create a kind of distrust in the minds of the labouring classes, and in that case even if the Government succeeded in establishing a monopoly its future success would be a doubtful speculation.

But a still greater bar to the success of a State monopoly of the silk industry in India would be the diversity of economic factors in production. In the first place, only a very few silk-producing parts in India enjoy the same favourable natural conditions as does the Kashmir State, and even if artificial methods were introduced into the system of production it would be hard to say whether they would prove as efficient as the purely natural factors. Moreover, the Government would not be in a position to frame rules and regulations which would be applicable to the entire Indian silk-producing industry as a difference in the economic conditions of two different areas would necessarily require fundamentally different laws governing the operations of the silk industry in these two areas. This procedure would

perhaps create provincial monopolies and again the system of central control would be completely ignored.

Another factor which would undoubtedly hamper the progress of the Government monopoly in India is the diversity of religious influences on the production of cocoons. It has been observed in a previous chapter that in some parts of India, there exists a distinct religious prejudice against the killing of the silkworm. This restriction or religious observance bears a direct economic relation to production, as it obviously limits the supply of labour required for the production of cocoons. Let us assume that a certain fixed percentage of the population would cast aside religious prejudices and would become rearers, with the result that a certain fixed output of cocoons would be available from that particular area. Now, if, owing to an increase in the demand, there is a tendency on the part of the monopolist to increase the amount of production, how could he rearrange his factors in production so as to obtain a larger output when labour is a fixed quantity? This difficulty would inevitably hamper the progress of the industry and would make any form of monopoly impossible.

The question of religious prejudice, however, does not affect the labour position in the reeling industry which exhibits entirely different economic features. Under the present circumstances it is subject to the same conditions as are other industries in which success depends more on the supervision and organisation of factories than on an abundant supply of labour.

But the price of labour is a very important factor from an industrial point of view. In Kashmir, as we have seen, there is hardly any competition in the labour market owing to a very limited number of indigenous industries, and that is the reason why the State does not encounter difficulties in recruiting labour for the cocoon-producing and the reeling industries. But in an Indian silk-producing province there is an entirely different set of circumstances which causes variations in the rate of wages. Take, for instance, the Bengal silk-producing areas, which possesses quite a number of rival industries each of which attracts labour from the

urban and suburban parts of the province. A lower scale of wages (or returns) in the silk industry at once causes a radical change in its labour force, and the workers seek employment in another industry which offers higher wages. We have referred already to the outflow of labour from the silk industry to the jute industry in Bengal, which was due mainly to the larger returns from the production of the latter fibre. Under a system of Government monopoly therefore, if the scale of wages in the silk industry were raised in competition with the rate in other industries, there would be a great reduction in the marginal profits, and finally perhaps it would be desirable to abandon the monopoly altogether.¹

And lastly, the political and the social elements play a much more prominent part in industrial organisation in India than in Kashmir. It has been possible to develop a system of State monopoly in Kashmir even with forced labour in certain cases, but a similar procedure would be utterly resented by the people in India, where industrial regeneration has linked itself more and more with political questions in recent years. It is therefore apparently against the industrial policy of any government to force a system of control which is bound to undermine the goodwill of the people.

A scheme of State monopoly of the silk industry in India on the lines followed in Kashmir would obviously fail to realise its objective. In order to solve the practical issue of the problem of development of the silk industry it is necessary to devise other means of control which may suit the economic conditions of the country. Of course, the determination of the policy of control is primarily based on the assumption that the silk industry is one which must be developed not merely from the point of view of industrial reform, but from the national point of view as well.

Realising the gravity of the present condition of the Indian silk industry, we find it reasonable to suggest that the industry should receive a generous treatment from the Government. The adoption of the system of bounties or subsidies appears

¹ The latter course was followed by the East India Company just before the middle of the nineteenth century.

to be a very good method of solving this intricate problem. The rate of payment of bounties depends entirely on the conditions prevailing in each silk-producing area, and it is therefore difficult to fix a limit or to suggest a specified scale without investigating the conditions which are likely to form a basis of the scheme.

Whatever the nature of the bounties may be, it is evident that there is a distinct line of demarcation between the bounties payable to the cocoon-producing industry and those payable to the reeling industry. In the first part of the industry it is essential that the system of bounties should be designed in such a way as to increase the profits of the producer, and to enable him to defeat the competition of other Asiatic cocoons. In the reeling branch of the industry the system of bounties should aim at increasing the efficiency of the reeling machinery, which also includes the factor of improvement in the quality of the raw silks produced. It has often been noticed that raw silks reeled from Indian cocoons in Italy and France have successfully competed with the real Italian and French silks in the European markets. This fact further proves that the Indian reeling industry needs a complete re-organisation on modern lines, and in the accomplishment of this responsible task, the system of bounties will be found to be of great material assistance.

It is needless to dwell here on the technical aspects of the system of bounties, as they have been fully treated in the last chapter in connection with the system adopted by the French Government. It is, however, important to point out that the unanimous opinion of the silk experts confirms the view that the Indian reeling industry is in urgent need of adequate financial provision for its re-organisation. There is no doubt that even a partial financial support by the Government in this direction would involve the expenditure of large sums of money, and would require a corresponding increase in the revenue, but there are at the same time other sources of revenue within the silk industry which might be tapped to supply the financial needs of one of its branches.¹ The

¹ A possible source of revenue is suggested in the establishment of a Conditioning House. See a later chapter.

possibility of an import duty on raw silk or silk goods depends entirely on the future fiscal policy of the Government, and is therefore of little significance as regards the present situation. But even if there were no other direct sources of revenue, the expenditure on the resuscitation of an important textile industry would realise its returns in the ultimate development of the industrial resources of the country, and would then be quite justifiable from the point of view of wider national interests.

A brief review of the last two sections of this work might be given here to recall the application of the fundamental economic laws to the silk-producing industry and to establish a link between the different parts of the subject. In the first place, the economic analysis of the industry in question reveals its peculiar position in the industrial world, and clearly shows that although its preliminary activities are analogous to the activities of the agricultural industry, yet its distinguishing features stand on quite a different level. The laws governing the problem of efficiency for instance, in the cocoon-producing industry are distinctly different from those ruling in the agricultural industry. Again, the particular principles of production in sericulture have nothing in common with the principles applied to general agricultural crops, and the effects of production on the economic well-being of the producers are also widely different in these two cases.¹

Secondly, the silk-producing industry possesses special economic characteristics. It can be practised both as a subsidiary industry or as a main occupation, according to the nature of the seed used. If the seed is univoltine, the producer obtains one crop during the year, if it is multivoltine, three or four crops can be obtained per annum ; so that even the surplus stock of labour in a country can be utilised for subsidiary operations connected with the production of raw silk. The value of sericulture as a profession lies in the amount of efficiency and skill which a rearer possesses, and also in the scientific knowledge which he is capable of converting into a productive economic activity.

¹ It may be observed that the general habits of the rearers owing to indoor life, acquire an individuality if the occupation is carried on through generations.

Thirdly, we have seen that the two principal factors which determine the possibility of success in the silk-producing industry are the quality of the industrial organisation and the efficiency of the labour force. The fact that the price of labour plays a very important part in the production of raw silk indicates that the real basis of competition between the European and the Far Eastern countries is the difference in their labour conditions. In France, the dangers of this difference were realised during the closing years of the last century, and in order to preserve the existence of the silk-producing industry and to meet the competition of the Eastern raw silks, protective measures were adopted by the French Government. In Kashmir, on the other hand, the industry was fostered, developed and protected by a system of State monopoly. The nature of these measures clearly explains that the Chinese silk industry,¹ owing to its remote antiquity, its perseverance, and its vast supply of cheap labour, has been the pivot of competition since the commencement of the period of international commerce.

The present chapter, with its complicated problem of monopoly, concludes the study of the economic aspects of production of raw silk. The subject, however, extends still further and finds the manifestation of its economic working in the consumption of raw silk, which is by no means isolated from production. In fact, there is a direct theoretical relation between the producer and the consumer. In the former we find an expression of supply, and in the latter an expression of demand. Each of these expressions contributes to the equalisation of the other, and, therefore, it is necessary to pay equal attention to both of them.

In the next section we shall examine the economic features of consumption of raw silk with reference to a given silk-manufacturing industry and a given silk market. We shall therefore pass from the producer to the consumer in order to study the different aspects of demand and supply.

¹ The Japanese silk industry has made remarkable progress during the last fifty years or more, and may now be classed with the Chinese industry as an active competitor.

PART IV

CHAPTER XIV

CONSUMPTION OF RAW SILK

THE SILK-MANUFACTURING INDUSTRY—

PRELIMINARY

AFTER crossing the boundaries of production of the raw material we should be prepared to face an entirely new set of economic problems, which are much more complicated than those considered in the last section. In the production of raw silk we were dealing mainly with the agricultural or semi-agricultural communities of the producing countries, and were examining the laws of production in the light of the producers' economic activities, which were more or less simple owing to the simplicity of the industrial operations and general surroundings. But now we are entering into an advanced stage of industrialism, where the production of commodities is governed by complicated economic laws. The manufacture of silk fabrics involves the consumption of raw silk and for the completion of the various stages of production it demands the full co-operation of the higher arts of civilisation, such as the arts of spinning, weaving, dyeing, finishing and designing. It is due principally to these demands that the economic environment in the silk-manufacturing industry is entirely different from the economic environment in the silk-producing industry. The manufacturing industry, in most cases, owes its prosperity and extension to factory organisation and to a much wider sphere of technical education, while the silk-producing industry owes its growth to a comparatively simpler organisation based on the cottage industry system. It is therefore quite evident that the forms of production discussed in the last section have little in common with those we shall discuss in the succeeding pages.

Before attempting to examine the fundamental economic features of the silk-manufacturing industry, we might point out at this stage that a complete study of its organisation, both industrial and commercial, would cover a series of volumes embodying researches carried out by different investigators and spread over a number of years. Such a process would undoubtedly increase the difficulties which confront the investigator in the presentation of inter-relations between the different parts of the subject. In order to avoid delay and to establish a continuous link between the production and the consumption of raw silk, we shall treat only those aspects of the silk-manufacturing industry in this section of the book, which directly or indirectly concern the consumption of the raw material.

The silk-manufacturing industry has been known to the world since very early times. But, before the commencement of the era of machinery and of modern industrial revolution, the development in the processes of silk manufacturing was slow, and owing to the high cost of production and to the consequent high prices of the finished articles, the industry was practised only to meet a limited demand. The gradual development in the arts of production and in the means of transport was followed by a movement towards manufacturing on a large scale, and during the later part of the eighteenth century, certain mechanical inventions were introduced into the silk-manufacturing industry which greatly facilitated the mechanical working of the looms and exercised considerable influence on the economic evolution of the industry in Europe. In the beginning of the nineteenth century the appearance of the Jacquard¹ machine caused a great sensation among the silk manufacturers in France, and the history of the French silk industry shows that its subsequent prosperity was mainly the result of this and other inventions. The principal effect of the Jacquard machine and the power loom was to lower the cost and to increase the amount of production. With the growth of internal economies in manufacturing and with the expansion of markets, the silk-manufacturing industry made rapid

¹ It first appeared in 1804, but was not perfected till the year 1817.

strides during the whole of the nineteenth century, and established itself in Germany, Switzerland, Russia, and Austria, in addition to maintaining its position in France and Italy. Finally, the United States of America also entered into the field of competition, and by dint of energetic enterprise, built up a powerful silk-manufacturing industry within recent years.

In the last paragraph we have briefly referred to the expansion of the silk-manufacturing industry in Europe, and

CONSUMPTION OF RAW SILK.

Consuming country.	Average for 1908-09 in millions of pounds.	Average for 1910-11 in millions of pounds.	Average for 1912-13 in millions of pounds.
United States . . .	20.35	21.45	25.74
France	9.57	9.13	9.46
Germany	7.37	7.70	7.92
Switzerland	3.52	3.63	3.96
Russia	3.30	3.63	3.74
Italy	2.64	2.53	2.53
Austria	1.76	1.65	1.76
England	1.43	1.21	1.54
Other countries . .	3.30	3.41	4.40
Total	53.24	54.34	61.05

to its latest growth in the United States. But when considering the world's consumption of raw silk and the effect of buyers' competition on the prices of the raw material, we must take into account the relative importance of consumption in each manufacturing country. In order to illustrate this point, we shall examine the figures showing the total annual consumption of raw silk in the principal silk-manufacturing countries of the world. The above table compiled from the annual statistics issued by Messrs. Chabrières, Morel and Co., of Lyons, indicates the annual consumption of silk in the United States, France, Germany, Switzerland,

Russia, Italy, Austria and England. The figures given here show the biennial averages¹ for 1908-09, 1910-11, and 1912-13, and represent the pre-war normal consumption of silk in these countries.

The last table is significant for two reasons; firstly, because it shows the relative position of each consuming country, and secondly, because it indicates the increase in the total consumption of raw silk from 1908 to 1913. The predominant position of the United States as the largest consumer of raw silk is quite obvious, but a very interesting feature of her silk-manufacturing industry is that, within a period of five years its consumption of raw silk has increased by more than five million pounds. Reviewing a period of fifteen years, from 1899 to 1914, we find that the consumption of raw silk in the United States has increased by more than 250 per cent. The following figures, quoted from the United States Census of Manufactures, Table XVI., show the total amount of raw silk consumed in all textile mills at four different stages:—

—	1899.	1904.	1909.	1914.
Consumption of raw silk (in pounds).	9,760,770	11,572,783	17,729,306	25,021,945

It may be noted here that the above figures do not include the consumption of silk yarn and spun silk, which amounted to 5.04 million pounds in 1899 and to 10.63 million pounds in 1914. The table on p. 199 also does not take into account the quantities of silk yarn and spun silk consumed in the United States, but it is evident that even without the inclusion of these quantities, the biennial average consumption of raw¹ silk for 1912-13 in the United States was 42.1 per cent. of the total consumption in the organised silk industries of the world. The figures quoted above clearly show that

¹ The biennial average has been obtained by dividing the sum of two years' consumption by two. This method gives a more satisfactory result than the method of taking annual figures, as it includes two distinct seasons.

the silk-manufacturing industry in the United States has made a great advance in recent years, and may possibly extend still further in the future, thus entailing greater demands on the world's production of raw silk.

In Europe, France is the most important consumer of raw silk. In spite of the increased foreign competition, the French silk-manufacturing industry has maintained its former position during the last fifteen years. Although the figures given in the table on p. 199 show a decline in the biennial average consumption from 9.57 million pounds during 1908-09 to 9.46 during 1912-13, yet the actual position of the French silk manufacturing has not undergone any material change. The annual rate of consumption of raw silk in France shows slight variations, owing to the variations in the demand for particular fabrics, but, for all practical purposes, these variations may be ignored and the annual consumption of raw silk may be stated as about 9.4 million pounds.

Next to France, Germany plays a very important part in the consumption of raw silk in Europe. Owing to the extension of the silk-manufacturing industry in Germany, the consumption of raw silk increased from an average of 7.37 million pounds in 1908-09 to an average of 7.70 in 1910-11, and to an average of 7.92 in 1912-13. The increased consumption of raw silk during the six or seven years before the war indicates that Germany was striving hard to raise her industry to the level of the French silk industry. It is difficult to say whether her efforts would succeed in the future, as any further extension, or even the maintenance of the existing silk industry in Germany would depend entirely on the supplies of raw silk she would be able to obtain from the silk-producing countries.

Switzerland, Russia, and Italy may also be regarded as important consumers of raw silk. The Swiss silk industry in particular is a progressive industry and enters into successful competition with the other prominent silk industries of Europe. As regards the Russian silk industry, it is impossible to anticipate the future course of events, owing to the present industrial chaos, but it is evident from the figures

quoted in the table that before the war the consumption of raw silk in Russia was steadily increasing. The increase in the biennial average, from 3·30 million pounds during 1908-09 to 3·74 during 1912-13 is quite significant. The consumption of raw silk in Italy has remained more or less constant during the last fifteen years, and taking the biennial averages for 1908-09, 1910-11 and 1912-13 into consideration, we may assume that the average annual consumption amounts to about 2·55 million pounds.

The Austrian silk industry, though comparatively very small in so far as the consumption of raw silk is concerned, played an important part in the European markets for silk goods before the war. Its products found a ready sale in England, and encouraged by the successful competition with certain British silk goods, its organisers extended the plant and increased the output. It may be presumed that during the next few years the Austrian silk manufacturers would endeavour to reorganise the industry in order to make up for the loss incurred during the war. An increase in the annual rate of consumption of raw silk would naturally depend on the future progress of the manufacturing industry.

Now we come to the British silk-manufacturing industry which according to the figures given in the table on p. 199 is a very small consumer of raw silk. Taking the biennial average for 1912-13 into account, we find that the annual consumption amounted to 1·54 million pounds. But it must be remembered that these figures represent only the amount of raw silk imported into the United Kingdom, and do not include those quantities of thrown silk which are consumed in the British textile mills, but are prepared for the looms either in France or in Italy. The actual dimensions and the consuming capacity of the British silk industry must be judged from the total annual consumption of raw and thrown silks in Great Britain. The biennial average of the imported thrown silk ¹ for 1912-13 was 1·13 million pounds according to the figures issued by the Board of Trade. Adding the latter figures to the figures quoted previously

¹ Only a very small quantity of it is re-exported. For all practical purposes we may regard the whole of it as retained for consumption.

(i.e., 1.54), we find that the average annual consumption of raw and thrown silks in Great Britain amounted to 2.67 million pounds during 1912-13. Making a due allowance for the possible annual "carry over" of the imported thrown silk, I think the annual consumption of silk in the British textile mills may be estimated at about 2.5 million pounds.

Another point of rather minor importance is the analysis of the heading "other countries" in our table. In the absence of detailed statistics, it is difficult to specify exactly the consuming countries which are included in the "other countries," but probably Belgium and Spain come under this heading. It is certain, however, that the estimate given in the table does not include the consumption of raw silk in Persia, India and the Far Eastern countries.

The exclusion of the oriental consumption of raw silk from the figures issued by the Lyons firm is due chiefly to the fact that the silk-manufacturing industry in the eastern countries is not organised in the modern sense of the word, and therefore it is impossible to form an exact estimate of the annual consumption of raw silk in those countries. As regards Persia in particular, no definite information is available as to the consumption of raw silk in the manufacture of fancy silk fabrics which are still produced in some parts of the country. In the case of India it is possible to give only an approximate estimate of the consumption of raw silk, based on figures for net imports, exports, and production.

Let us first examine the consumption of raw silk in India. According to the returns published by the Department of Statistics, the net average annual import¹ of raw silk into India during the biennial period 1911-12 to 1912-13 amounted to 2.87 million pounds, and the average annual export of Indian raw silk during the same period amounted to 1.71 million pounds. Taking the average annual production of raw silk in India during the period under review as 2.36 million pounds, we find that the total annual amount available for home consumption was 3.52 million pounds. The following brief table clearly explains the position of Indian

¹ The Net Imports are obtained by subtracting the Re-exports of foreign silk from the Imports.

annual consumption of raw silk during the biennial period 1911-12 to 1912-13.¹

Biennial Average for 1911-12 and 1912-13.	Millions of pounds.
Net import of raw silk into India. . . .	2·87
Approximate home production of raw silk . . .	2·36
Net import + home production (total)	5·23
Export of Indian raw silk	1·71
Total available for consumption in India . . .	3·52

It might be remarked here that out of the total annual export of 1·71 million pounds of Indian raw silk during the period under review, only 25 per cent. was exported to Europe.² If the overland imports of raw silk into India could be supposed to account for about 450,000 pounds, the total annual consumption of raw silk in the whole of India would amount to about four million pounds.³

The domestic consumption of raw silk in Japan, as well as in China, is enormous, but owing to the absence of reliable statistics, it is impossible to give any figures. We have already stated that the production of raw silk in China is an unknown quantity, and in the case of Japan also no definite information is available. In the absence of figures for production it is obviously risky to hazard an opinion even on the approximate consumption of raw silk in these two countries.

Before concluding the preliminary sketch of the world's consumption of raw silk, we might point out that so far, no reference has been made to the silk-spinning industry which

¹ These are official years as recorded in the trade returns. The year 1911-12 represents one season and 1912-13 another.

² See "Statistique de la Production de la Soie," for the year 1914, published in Lyons.

³ Owing to the unsatisfactory nature of the official figures for overland imports, I have given above an independent estimate, in order to determine the approximate consumption of raw silk in the whole of India.

consumes large quantities of the waste silk. As, however, the waste silk is an important by-product of the silk-producing and the silk-manufacturing industries, it would be necessary to study the economic aspects of its consumption in a later chapter.

In the present chapter we have given a preliminary sketch of the consumption of raw silk in the principal manufacturing countries, and have indicated the progressive increase in the world's annual consumption, which is due chiefly to the expansion and development of the silk industry in the United States. By comparing the rate of increase in consumption with the rate of increase in production, we find that the former outpaces the latter. This relationship between consumption and production or between demand and supply exhibits some interesting economic features in the silk markets. But as these features are rendered complex by the varying conditions of market organisation, it is necessary that they should be studied in connection with a particular silk industry and a particular silk market.

We have observed previously that at the present time the British silk industry is one of the smallest silk industries in Europe. But even although it is very small in size, it represents one of the finest types of the organised industry and, consequently, presents almost all the essential economic problems which are involved in modern industrial organisation. The problem of demand and supply, the question of foreign competition and tariffs, and the problem of commercial organisation are all intimately related to the operations of the British silk industry. As our fundamental interest lies in the solution of the various problems which we have stated already, and also in the working of the general economic principles in the silk industry, we shall select the British silk industry as representing our particular type. During the course of our study, however, we shall have occasion to refer to the methods of production adopted in France, in the United States, and in the other important silk-manufacturing countries. With this object in view we shall proceed to study the distribution of the silk industry in Great Britain in the next chapter.

CHAPTER XV

THE BRITISH SILK INDUSTRY

DISTRIBUTION OF THE INDUSTRY IN GREAT BRITAIN

A PICTURE of the British silk industry, as it exists, presents several interesting details to the student of the economics of industry. The more or less scattered nature of the industry gives Britain a peculiar position among the silk-manufacturing countries of the world. Comparatively speaking, it covers a large area without wholly concentrating itself in any one place. The result of this scattered character of the industry is that in the first place, labour is to a small extent highly skilled, but mainly semi-skilled, and in the second place, the industry itself does not find a prominent place among the other textile industries of Great Britain. There is no exact division between different districts as regards manufactures, and the lack of specialised makers of silk machinery forms another handicap which is overcome only by the best equipped firms.

On a general survey the industry may be divided into three main branches. The first main branch is the net silk industry, which involves the manufacture of cloth and other silk goods from raw silk employed either in the thrown or in the unthrown state. Then comes the spun silk industry, in which the silk waste obtained in the reeling, winding and throwing processes, is used. Thirdly, there is the artificial silk industry which is growing every year, and in which chemically treated vegetable fibre is used. In so far as the lines of industrial division are concerned, the first two branches named are divided into several subdivisions, which we shall consider separately when dealing with the localisation of the main branches. As regards the third main division, it may be pointed out that neither its raw material

nor its finished product is directly related to the present subject, and for this reason it would be sufficient to confine our analysis of it to casual references.

Spinning is the dominant branch of the British silk industry, and plays a very important part in the employment of labour and material. As a matter of fact, the enormous development in spinning is due to England's initiative, and other countries have either followed the same lines or introduced processes slightly different from the original process.

We have already remarked that it is very difficult to separate the silk-manufacturing area from the other industrial areas, or even to draw a line between the areas occupied by the spinning and the manufacturing branches of the British silk industry. In order to avoid this complexity we shall study the subject of geographical distribution of the industry by considering each area in turn.

For the sake of convenience, the total area in England in which the silk industry is practised in some form or other, might be divided into three divisions. The first division might be called the central area, the second the eastern area, and the third the lower central.

Let us first examine the importance of the central area in which the industry exhibits a variety of aspects. In this area Macclesfield has long been a leading centre. It was once very famous for its exquisite productions which, for a long time held the highest position in the list of British silk manufactures. The industry was in a very flourishing condition before the year 1860, employing between 5,000 and 6,000 looms. By 1885, the industry had gradually declined and the number of looms had dwindled to 2,750, comprising 2,000 hand looms and 750 power looms. A further decline in the productive capacity of the Macclesfield silk industry took place between 1885 and 1904. The number of looms in the latter year was only 1,250; of these 450 were power looms and 800 hand looms.¹ Since 1904 the total number of looms has remained more or less constant, though there has been a further reduction in the number of hand looms.

¹ See "Report of the Tariff Commission," Vol. II., Part VI., para. 3,064.

The distinguishing feature of the Macclesfield industry is that it produces a richer quality of goods and, owing to its originality of design and the vastness of its enterprise, it defeats foreign competition. The throwing branch of the industry, which in former times enjoyed great prosperity, is now practised by a small number of firms. The majority of firms are engaged in the manufacture of silk handkerchiefs, mufflers, general neckwear, silk cloth for ladies' blouses, knitted goods, and other plain silks for shirtings. In order to maintain the high standard of quality, the manufacturers use a very good class of raw silk.

As a rule there is no combination of functions in the Macclesfield industry. The spirit of "specialism" is the keynote of the industry, and each firm confines its activities to a particular class of goods. The deviation from this rule is, however, noticeable in the case of two enterprising firms, which combine spinning and throwing in their businesses, in addition to the weaving of silk fabrics. Although this combination of functions increases the difficulty of organisation, there is reason to believe that additional advantages are secured by the manufacturers by utilising the throwing and winding wastes in their own factories.

Another feature worthy of note is the presence of a small number of hand-loom weavers in Macclesfield. In spite of the latest developments in weaving by automatic machinery, the silk industry has not been able to dispense with the services of the hand-loom weaver even at the present day. The hand-loom weaver is still the motive force in the production of artistic designs in silk weaving, and Macclesfield may still boast of its weavers who contribute to the well-being and the future progress of the British silk industry. The rich quality of cloth woven by these weavers is meant only for a specialised market, and its production is therefore more subject to the seasonal fluctuations in demand than that of any other class of silk goods.

The processes of dyeing and finishing of silk fabrics and thrown silks form a special branch of the industry. In recent years the science of dyeing textile goods has reached a stage of development where it demands independent

growth and exclusive attention, and, in order to meet the new conditions, a large number of silk manufacturers depend on the co-operation of the specialised firms of dyers and finishers.

The silk industry in Macclesfield, on the whole, is well organised, having a corporate body known as The Silk Trade Employers' Association. This body works in the interests of the silk industry and introduces new schemes for improvement whenever necessary. In former times a powerful union of workers existed to regulate the rates of wages, but its position was gradually weakened by the decline of the industry, and probably it disappeared before 1885.

Bradford holds the second position in the central area, and in some respects is as important as Macclesfield. It is one of the leading centres of the textile industries, and the major part of its industrial activity is represented by worsted manufactures. It has a great advantage in possessing modern institutes, where the progressive elements of art and science are applied to help the spirit of industrialism.

The difficulty of differentiating the silk industry from other textile industries in Bradford arises when we have to estimate its individual extent. A large number of firms use raw silk in conjunction with other fibres, such as cotton and wool. This intermixture of various fibres renders the position of the silk industry quite peculiar.

From the point of view of consumption of raw silk the principal manufactures worthy of note are *crêpes-de-chine*, taffetas, and plain silks of good quality. Spun silk yarns are also used by a well-known firm in the manufacture of pile fabrics such as velvets, plushes, and imitation furs. In addition to these manufactures, sewing and embroidery silks are also produced in Bradford.

Considering the present position of the silk manufacturing and spinning industry in Bradford, we may say that it has suffered as much from foreign competition as any other branch of the silk industry in Great Britain. During the last thirty years or more there has been no increase in the extent of the industry, and it is difficult to say whether the conditions have even remained steady. The production of

spun silk yarns and the manufacture of pile fabrics do not now enjoy the same prosperity as they did in the "eighties." The consumption of raw silk also in Bradford proper has declined considerably during the last thirty years.

South Reddish, near Stockport, in the same area, has gained prominence during the war on account of its manufacture of velvets and plushes. The absence of German competition in the home and colonial markets during the war offered exceptional opportunity to the manufacturers of velvets, plushes, and other pile goods, and in consequence of this facility, a revival of this branch of the industry took place in South Reddish during the early part of 1915. The principal feature of this branch of the industry is its power of consuming large quantities of spun silk yarn, a feature which not only enhances the status of the British silk industry, but also contributes to the welfare of the spinning branch of the industry.

The other important places in the central area are Brighouse, Halifax and Congleton, all of which are of considerable interest from the point of view of the utilisation of silk waste of all kinds. The spinning industry, which involves a number of processes such as degumming, cleaning, combing and roving, is widely practised in these towns. The greater part of the industry is concentrated in Brighouse; though there are three or four important firms in Halifax and Congleton. The industry, as a whole, absorbs more than ten thousand workpeople, and in some cases, as in Halifax, the spinners use the most modern and specialised machinery for drying and combing purposes. In this respect the spinning industry in the central area is in a position to withstand foreign competition.

It will be seen that large quantities of good silk waste of all kinds are required for the maintenance of the spinning industry in this area, and on account of the extensive use of spun yarn as a raw material for the manufacturing industry, the demand for silk waste in this country is expected to rise every year.

The question of foreign competition is intimately related to the activities of the spinning industry. The growing

importance of this branch of the industry may be fully realised by studying the increasing demand for its products, which in the past have successfully competed with the French, Italian and Swiss spun silks, but may have to compete with the Japanese silk yarns in the future. We shall consider this part of the subject in a later chapter.

According to our geographical division, next in importance comes the eastern area which includes the eastern counties of Norfolk, Suffolk, and Essex. Norwich and Great Yarmouth are the two famous places in this area. The former is an old seat of the silk industry. Mourning crêpes form the bulk of its manufacture, but in addition to this, light dress goods, such as poplins and silk mufflers are also made here.

There is a fairly large consumption of raw silk in Norwich, and if the adjacent town of Great Yarmouth is taken into consideration, the quantities reach a high total. In the latter place, a well-known firm manufactures those beautiful diaphanous fabrics that are highly prized by the leaders of fashion. Crêpe-de-chine, crepoline, ninon, gauzes and other beautiful silken stuffs are made here. The prosperity of the Yarmouth silk industry is due to the enterprise of this firm in widening the scope of the goods manufactured. Braintree and Bocking are known for their elaborate silk brocades and velvets for dress and decorative purposes. Sudbury in Suffolk contributes to the list of silk manufactures by producing umbrella silks and hand-loom velvets. Silks for the drapery and hosiery trades are also manufactured here, and some high class decorative and furnishing silks are made by a modern and enterprising silk-weaving company. The quality of design and its variety, combined with fine texture, results in some exquisite productions.

The lower central area which includes Leek, Coventry, Nottingham and Derby also attracts considerable attention, owing to its important share in the British silk industry. Leek plays a specially important part, being the centre for sewing and embroidery silks. There are four very large firms, which, in addition to their varied manufactures of artificial silk, use considerable quantities of raw silk for the production of beautiful embroidery silks, braids, trimmings,

and weaving yarns. There is no doubt that the increasing consumption of artificial silk has proved detrimental to the pure silk industry of Leek ; but still there is sufficient room for the consumption of real silk which is irreplaceable in certain manufactures.

The dyeing and finishing of manufactured silks is done in Leek by a highly specialised and renowned firm of dyers. Apart from the local demand, silks from other centres are also sent to Leek to receive the final touches.

The spinning branch of the industry, which was once in a flourishing condition in Leek, is now practised only by two or three firms. The silk waste obtained from the local factories is used in spinning. There is only one firm of spinners which prepares spun silk yarns from Chinese, Japanese, and European silk wastes.

The history of the Coventry silk trade presents a very gloomy picture of the gradual downfall of a particular branch of the British silk industry. The town of Coventry was once famous for the manufacture of beautiful ribbons, hatbands and braids, but the excessive weight of foreign competition has reduced this part of the industry to an insignificant size. Moreover, the decreasing demand for narrow web goods in this country has also reacted on the prosperity of the Coventry silk trade, and at present only three or four firms are engaged in the manufacture of hatbands, belts, ties, lace and ribbons. Pictures woven in silk and other artistic silk productions have all been replaced by cheap foreign articles of the same kind. There are no more of those handloom weavers who used to work out beautiful designs in their own houses. This gradual decline of the industry sufficiently indicates that the consumption of raw silk in Coventry is very small at the present time.

There has been, however, a remarkable progress in the direction of artificial silk. This industry has centred itself in Coventry and has achieved great success in recent years. The increasing demand for the artificial silk fibre has ousted raw silk in almost every branch of the British silk industry, and Coventry being the first centre of production, claims the credit of this transition.

Nottingham is another important town in the lower central area. Although there is not a very large consumption of raw silk here, yet the nature of the industry gives it a certain amount of significance. On account of the growing demand for silk hosiery and ladies' veils, the fine quality of Nottingham manufactures is still maintained. The Nottingham lace trade has always won fame, and has successfully competed with the continental manufacturers. Silk gloves are also made here.

It might be observed here that the Nottingham silk industry requires a very fine quality of silk thread which is generally highly thrown. This particular requirement of the industry led to the establishment of a large number of throwing mills within twenty miles of Nottingham, and for a long time the local demand for thrown silk was supplied by these mills. But a few years after the commencement of the era of foreign competition,¹ the throwing industry began to decline, and the continental throwsters began to invade the English market for thrown silk. The disappearance of a large number of throwing mills was followed by the growth of silk merchants and importers, who ultimately established connections with the French and Italian throwsters, and became the suppliers of continental thrown silk in the English market. It is believed that the bulk of the thrown silk used in the Nottingham silk industry is now imported from the Continent.

Derby is situated in the same area as Nottingham and possesses a small silk industry. Its throwing industry has suffered in the same way as that of Nottingham, and at present there are only two throwing mills in this locality. The principal firms are engaged in the manufacture of silk cords, trimmings, braids, silk coverings, and ladies' millinery goods.

Here again artificial silk has ousted real silk, and as a matter of fact, about 90 per cent. of the trade is now carried on in artificial silk. Insulating materials for telephone cables and general electrical purposes are also made in

¹ The era of foreign competition began in 1860, after the ratification of the Cobden Treaty with France.

Derby ; but these involve a very small consumption of raw silk.

In addition to the areas in England mentioned above, the silk-manufacturing industry is carried on in some form or other at several small places, such as Leigh, Taunton and St. Albans. Tiverton is the only place where about 1,500 people are employed in the manufacture of silk nets and goods of a similar kind. At other places near London, small quantities of silk are used, but the extent of consumption is so small that it is hardly worth mentioning.

The present position of the silk industry in Scotland also attracts our attention. Hand-loom weaving is almost extinct in the old districts around Glasgow, but the power loom has taken its place in the suburbs, where a leading firm of silk manufacturers has developed the weaving industry.

There are two large silk factories, one in Larkhall, and the other in Lochwinnoch, where tapestries, dress goods and mufflers are manufactured. A large variety of designs is produced, including some gorgeously and brightly coloured, which serve the purposes of the Eastern markets. *Crêpe-de-chine* and other finer materials in plain silks are also made for home consumption. Scotland thus contributes to the list of silk exports from the United Kingdom, and at the same time adds to the products of the British silk industry.

The throwing branch of the British silk industry is represented in Glasgow by a large firm of throwsters, which enjoys great prosperity. In addition to the local demand, this firm receives orders from other centres in England. There are no other places in Scotland where the silk industry is practised systematically or even where there is any appreciable consumption of raw silk.

Before concluding our survey of the British silk industry, we might note here that in Ireland, Dublin is the only place which possesses a small silk industry. Silk poplins and cravats form the principal Irish silk manufactures, and these goods find an outlet not only in the home market, but also in the foreign and colonial markets.

It will be seen from the sketch of the geographical distribution of the British silk industry that the other textile

industries are so completely mixed with the silk industry that an exclusive survey is practically impossible. For instance, even at present, in some districts of London, there are firms engaged in the manufacture of upholsterers' trimmings in which a small quantity of silk is used, but which on account of a mixed trade cannot be classed under a definite heading. This intermixture of the cotton, wool and silk trades makes the statistical survey of the silk industry extremely difficult.

We have already observed that the outstanding feature of the British silk industry is its scattered character, which distinguishes it, firstly, from the other textile industries of Great Britain, and secondly, from the silk industries of other countries. The first point of differentiation is clearly illustrated by the concentration of the cotton industry in Lancashire, and by the localisation of the woollen industry in Yorkshire. But the second point, which is more significant than the first, can be illustrated only by examining the nature of distribution of the silk industry in some of the prominent silk-manufacturing countries. For purposes of comparison, we shall give now a brief sketch of the French silk industry, and show how its distribution differs from that of the British silk industry.

Unlike the British silk industry, the manufacturing branch of the French industry is concentrated chiefly at Lyons, St. Etienne and its environs. Paris also possesses a small silk industry for the manufacture of sewing and embroidery silks, and the throwing industry still flourishes in the industrial localities of the provinces of Vaucluse, Gard, Loire and Ardèche.

The most interesting town in France, from the point of view of silk manufacturing, is Lyons. Before the last decade of the nineteenth century when the silk manufactures of Germany and Switzerland were in their infancy, Lyons held the foremost position in the world. The Lyons weaver still stands at the pinnacle in so far as deftness in workmanship and efficiency are concerned, though for a long time he had to struggle against competition with foreign goods even in his own country. This ever-growing competition has inspired

in the French weaver a spirit of confidence which makes his position stable in the silk industry. In the richer classes of the community there is still a large demand for his remarkable and exquisite creations, and so long as this demand exists, the Lyons weaver has every reason to believe that his work will be crowned with success.

The manufacturing industry in France has three distinct branches, each of which differs from the other in its proportionate consumption of raw silk. The first branch is the throwing industry whose importance is significant for two reasons: firstly, because it prepares silk for the French looms, and secondly, because it supplies the British and American markets with thrown silks.¹ This branch of the French silk industry has made great strides in the past, and its concentration in some of the sericultural districts has also contributed to its prosperity.² But it must be remembered that the throwing industry is subject to fluctuations, as the demand for thrown silks increases or decreases with the demand for articles in which they are used, and, from this point of view, its future depends largely on the stability of fashion of those fabrics whose manufacture necessitates the use of highly twisted silks.

Next we come to the weaving branch of the industry, the principal centres of which are Lyons and St. Etienne. The former specialises in various grades of silk manufactures. Muslins take a very prominent place in the list of her productions. Plain silks and figured tissues are no less important from the point of view of beauty of design and quality. These are sometimes mixed with gold and silver to supply the demand of the Eastern market, especially the Levant. Large quantities of mixed plain and figured goods are made for local purposes. In these, silk is used in combination with either cotton or wool. Gauzes, grenadines, crêpes, crêpes-de-chine come next in merit. The United Kingdom holds a high place among the customers of Lyons in these

¹ The thrown silks exported from France consist generally of trams and organzines.

² In the next chapter we shall state the causes that led to the concentration of the throwing industry in some of the sericultural districts.

goods, and then comes the United States of America. In addition to these silken stuffs, tulles, lace, braids and trimmings are also manufactured for exportation to America and other countries.

The principal articles manufactured in St. Etienne and its environs are velvet with satin back or "armure," figured velvets, satin back or all silk "armure," and pure silk velvets. Most of these manufactures are exported to Morocco, Algeria, Tunis and India.

Ribbons and other narrow-web goods are "specialities" of the St. Etienne trade. Different varieties are made, such as plain, black silk, plain in different colours, and figured silk ribbons. These are partly consumed by the home market and partly exported to Great Britain, America, and some of the European countries. A certain amount of braids, trimmings, and elastic tissues of various kinds is also made here, but the manufacture of these articles is not constant, as a good deal depends upon the market demand for these goods, which is governed mainly by the vagaries of fashion.

The third, and by no means the least, important branch of the French silk industry is spinning, which is concentrated all around Lyons, along the banks of the Rhône. The product of this industry, that is, the spun silk yarn, is partly consumed by the French looms as a raw material, and partly exported to Great Britain and the United States for manufacturing purposes.

The brief sketch of the French silk industry which we have given above clearly shows that the industry is concentrated in three large centres. A similar example of concentration may be found in Germany, where the silk-manufacturing industry is concentrated mainly in Crefeld, Elberfeld and Barmen, and partly in Chemnitz and Freiburg. The Italian silk-manufacturing industry is concentrated chiefly in the province of Lombardy, and in Switzerland, Zurich is the most important centre. A general review of the industrial conditions in Europe will show that in most cases the silk industry is concentrated in two or three large centres.

In order to complete our comparison let us examine the distribution of the silk industry in the United States. We

have already observed in the last chapter that the United States is now the largest consumer of raw silk in the world, and her silk-manufacturing industry has made enormous progress within recent years. It is therefore interesting, as well as instructive, to study the economic features of an industry which has made a very rapid advance in a comparatively short period. But as the space at our disposal does not admit of a lengthy account of the industry here, we shall offer only a brief sketch showing the distribution of the silk industry in the United States. The following table¹ shows the number of silk establishments in each State and the average number of wage earners employed in those establishments during the year 1914, thus affording a general view of the distribution of the industry in each State :—

DISTRIBUTION OF THE SILK-MANUFACTURING INDUSTRY IN THE UNITED STATES.

Census of 1914.

State.	Number of Establishments.	Wage earners.	
		Average number.	Per cent. distribution.
United States (total) . . .	902	108,170	100·0
Pennsylvania	284	44,755	41·4
New Jersey	368	28,263	26·1
Connecticut	44	10,668	9·9
New York	143	11,659	10·8
Massachusetts	19	4,495	4·2
Rhode Island	12	2,325	2·1
Virginia	9	691	0·6
Maryland	5	874	0·8
All other States ²	18	4,440	4·1

¹ The figures given in the above table are quoted from the United States Census of Manufactures (1914). For complete statistics, the reader may refer to the part dealing with the Silk-manufacturing Industry, Table III.

² Includes establishments distributed as follows: California, 1; Delaware, 1; Georgia, 1; Illinois, 3; Maine, 1; Michigan, 2; New Hampshire, 2; Ohio, 1; North Carolina, 4; West Virginia, 1; Wisconsin, 1.

A glance at the map of the United States would at once show that the silk-manufacturing industry, according to the above table, is concentrated chiefly in the eastern States. As regards the employment of wage earners, the greatest concentration takes place in Pennsylvania, but the adjoining States, including New Jersey, New York, Connecticut and Massachusetts, also form important silk-manufacturing areas. Considering on the whole the vast expanse of the United States, we may say that the silk industry is concentrated in a limited area, and therefore the character of its distribution is entirely different from that of the British silk industry.

It is quite obvious from the brief sketch we have given above that the principal feature which differentiates the British silk industry from the silk industry in other countries is the nature of its distribution. We are not in a position to decide without further analysis of the facts, which form of distribution contributes more to the effective organisation of the industry and also to the economic conditions prevailing in the manufacturing areas, as there is no general rule which determines the superiority of one form of industrial distribution to the other. It would be worth our while, therefore, to study both sides of the question at the present stage of our inquiry.

It cannot be denied that the concentration of the industry leads to an efficient control and management of the distribution of the raw material, and also of the various operations that are necessary to maintain the life of the industry. In Great Britain, where the silk industry is scattered, the absence of a central market for buying and selling tends to increase the difficulties involved in the distribution of raw silk over a large area. On the other hand, in France, where the silk industry is concentrated mainly in Lyons and St. Etienne, the presence of a central market for raw silk in the former town greatly facilitates the distribution of the raw material.

From the point of view of the distribution of the raw material, there is one disadvantage in the system of concentration which manifests itself when the mechanism of trans-

port goes out of order. For instance, if the industry is concentrated, the whole area under manufacture is affected when there is an accidental transport difficulty. On the other hand, if it is scattered, only one or two units are influenced by such a disorder; the others receive their supplies as usual. This abnormal cessation of the lines of transport occurs only rarely, and may therefore be left out of our present consideration.

The problem of labour is another important problem which has a very close bearing on the nature of the distribution of the industry. In the case of the British silk industry we find that owing to its scattered character there is no definite labour force. Each manufacturing area derives its labour from its small source, and the manufacturer has to face the competition continually in the neighbouring labour market. The price he pays for a particular unit of labour is governed not only by its efficiency or grade, but also by the price of labour paid in other industries in the same area. But, in the case of the French silk industry, the labour supply is governed by different circumstances. During periods of industrial depression and abnormal commercial fluctuations, there are corresponding variations in the strength of the labour force available for the various operations, such as throwing, winding, etc., but in normal times its supply is nearly constant. The price of labour is determined by competition within the same industry, which renders possible the equalisation of the rates of wages within a particular branch of the silk industry. Moreover, there is a body of highly skilled labour which has achieved perfection in art and design after a long period of hard training. This is, in my opinion, the result of the concentrated character of the French silk industry. Apart from the efficiency resulting from an improvement in machinery, the individual efficiency of labour has undoubtedly increased in France during the last forty years or more. It is probable that the indirect effects of foreign competition have imparted this impetus to the French weavers and silk workers.

Considering the question of the distribution of the industry from the workers' standpoint, we find that in "bad times"

the whole industrial area is affected, and poverty is seen most where the silk industry is concentrated, and least where it is scattered. A sudden depression in the silk trade leaves no other channel open for the worker in the former case ; while, in the latter, he has a large number of openings for an occupation and can soon find a way out of the difficulty. There is no doubt that the solution of the problem of unemployment even in the case of a scattered silk industry depends largely on the character of the industries practised in the same area, but this is certain, that in the case of a concentrated silk industry the workers, during periods of depression, experience hardships which cannot easily be avoided.

Reviewing both sides of the present question we cannot but say that the balance is in favour of concentration, as there is a large number of moral and material advantages in this form of distribution of the industry. The greatest advantage lies in the training of labour and in the enlargement of its capacities, which are always in environments conducive to improvement, and can derive benefits from the institutions which have been established for the general advancement of the silk industry.

In the present chapter we have given a sketch of the distribution of the British silk industry, and in order to determine its distinguishing feature, we have considered the distribution of the silk industry in France and the United States. During the course of our analysis we have indicated the various forms of production and their industrial importance to the manufacturing localities. As we have shown, there is no line of demarcation between the different areas as regards the production of silk goods in Great Britain. The throwing branch of the industry is, at present, scattered as much as the weaving, dyeing and finishing branches ; but there is a certain amount of concentration of the spinning industry in the central area. In spite of the scattered character of the British silk industry a direct economic relation exists between the throwing branch and the actual manufacturing branch, which has induced the localisation of the former in those localities where the latter still flourishes. The partial concentration of the spinning industry is the

result of certain independent causes which have exercised no direct influence on the position of the silk-manufacturing industry, and it is necessary, therefore, to bear in mind the separate activities as well as the separate causes which influence the localisation of these two branches of the British silk industry. In the next chapter we shall examine, as far as possible, the nature of those influences which tend to cause the localisation of the individual branches of the silk industry in particular areas.

CHAPTER XVI

LOCALISATION AND FORMS OF INDUSTRIAL ORGANISATION

IN discovering the causes that led to the localisation of the silk industry in particular localities, we must bear in mind the industrial distinction between the different branches of the industry. The task of determining these causes is not so easy as it might appear at first sight. In the first place, the British silk industry has seen prosperous days, and, years ago, it was much more concentrated than it is to-day in any one part of Great Britain. The process of scattering and industrial disintegration commenced soon after the invasion of the foreign silk goods on the English markets, and within the last forty years the former centres of the industry in Spitalfields and Macclesfield either disappeared altogether or shifted to some more suitable localities; so that the influences which caused the localisation of a particular branch of the industry in these centres ceased to exist after the dispersion of the industry. In the second place, the development of the individual branches of the industry has taken place at different periods and at different places, and the causes of localisation in one case have not been identical with those in another case. In the face of these disturbing factors it is possible to give only those causes which determine the localisation of the three principal branches, *i.e.*, throwing, manufacturing,¹ and spinning. It might be observed, however, that this division is based on the inter-relation of the throwing and spinning branches to the manufacturing branch which consumes both the thrown silk and the spun silk yarn.

Let us take first the throwing industry into consideration.

¹ The term manufacturing, as used above, includes the processes of winding on bobbins, warping, weaving, dyeing and finishing.

It has been observed in the last chapter that during the prosperous days of the British silk industry, the throwing branch localised itself chiefly in Congleton, Leek, Nottingham and Derby; though, at the present time, throwing mills exist also in some of the manufacturing districts, such as Norwich, Macclesfield, Bradford and Glasgow. It is logical to suppose that the former localisation of the throwing industry in the towns named must have been the result of certain economies which could not have been secured in other places, and that its present localisation is also the result of economies of a similar nature. The principal issue of the problem is therefore the determination of the nature of these economies. But, before entering into the details of the problem, it is necessary to point out that the throwing of raw silk is a preliminary process in the silk industry, involving the preparation of the yarn for the loom and for subsequent manufacturing purposes. The raw silk thread as reeled from the cocoon is regarded as the initial fibre which requires further handling. In throwing it is "doubled" or "trebled" and twisted according to the requirements of the manufacturers. The number of "turns" and "twists" per inch of the thread depends on the nature of the trade in which it is to be used.

The nature of economies referred to in the last paragraph must be determined mainly in the light of the requirements of the manufacturing industry, since throwing is an essential operation preceding warping, weaving, and other manufacturing operations. It may be observed that purely natural advantages, such as favourable climatic conditions or the proximity of a port, have played no direct part in the localisation of the throwing industry in any country. In England, the principal cause of localisation was the presence of a manufacturing industry in the locality where a throwing industry was subsequently established. As thrown silk formed a raw material for the manufacture of crêpes-de-chine, ribbons, braids, and other silk goods, it was found necessary to organise a throwing industry within the area of production. Nottingham and Derby both possessed flourishing hosiery trades which required highly twisted silk,

and as the market for silk yarns in these two localities was sufficiently large to provide a steady demand for particular qualities of thrown silks, the establishment of the throwing industry became indispensable. Again, the process of localisation in Congleton was accelerated by the demand for thrown silks in Macclesfield, where the manufacturing industry enjoyed great prosperity. In Leek the production of sewing and embroidery silks exercised considerable influence on the localisation of the throwing industry. Moreover, the manufacture of sewings, weaving yarns and "machine twist" was a direct outcome of the throwing industry which flourished in Leek previous to the establishment of some of its new branches. In its later stage, the throwing industry undoubtedly maintained its existence on account of the presence of the closely allied manufacture of sewing and embroidery silks.

Taking a bird's-eye view of the present state of the throwing industry, we find that in the country as a whole, the small fraction of the industry which still survives, is placed in the immediate neighbourhood of the manufacturing branch. The manufacturers in Norwich, Macclesfield, Bradford and Glasgow either throw their silk within their own premises or receive their supplies from the local throwsters. In Nottingham, Derby and Coventry, only a small quantity of silk is thrown in the local mills; the greater part of it is imported from the Continent. The tendency of the leading manufacturers, however, is either to add a throwing mill to their own factories or to receive their supplies of thrown silk from the local mills. This tendency on the part of the manufacturers clearly shows that the economies resulting from the localisation of the throwing industry in a manufacturing area are associated firstly, with the ideal choice of the raw material and, secondly, with the cost of transit of the raw material from the throwing centre to the manufacturing centre. For instance, if the throwing branch were not localised in the manufacturing centre, it would be very difficult to meet the exact requirements of particular trades, and even if it were possible to obtain the thrown silk from distant centres, it would not pay in many cases to incur extra expense in the

transit of yarns from the throwing areas to a number of different places in the country. It is obvious, therefore, that the manufacturers who are consumers of thrown silks are, as a rule, inclined either to combine throwing and manufacturing or to place their orders with the nearest throwster.

It might be interesting to observe here that the development of the throwing industry in France has followed the lines of centralisation. The presence of a reeling industry was one of the principal factors which hastened the development of the throwing industry. The process of reeling is more closely allied to the process of throwing than any other process in the silk industry, and this relation between these two processes greatly simplifies the problem of training the workers for the operations of the throwing industry. The economic history of the French throwing industry shows that the moral and material conditions of the workers engaged in it have been the same as those of the workers employed in the reeling industry. Analysing the conditions still further, we find that the system of recruiting labour and the rates of wages have been based on similar principles in these two industries. The similarity in the processes and in the organisation of the reeling and the throwing industries accounts for the localisation of the latter in those areas where the former was already in a prosperous condition. Thus we find that the throwing industry in France did not localise itself in the immediate neighbourhood of the manufacturing industry, but on the other hand, established itself in the provinces of Ardèche, Vaucluse, Gard and Drôme, where the reeling industry helped its ultimate growth.

We shall now examine the nature of economies resulting from the localisation of the French throwing industry in the reeling districts, in order to find out in what way it differs from the form of economies which determine the localisation of the throwing industry in Great Britain. In the first place, the concentration of the manufacturing industry in Lyons and St. Etienne provides a central market for thrown silks, and thus avoids the transit of the raw material to a large number of places. Secondly, the lower rates of wages in the reeling districts cause a great reduction in the cost of throwing,

which would rise by at least 100 per cent. if throwing were done in Lyons. It will be noticed that the absence of a reeling industry in England deprives the throwing industry of those advantages which the French industry enjoys on account of its localisation in the reeling districts. Finally, the comparatively lower railway rates for silk goods in France do not increase the cost of transport of thrown silk from the throwing centre to a manufacturing centre to such an extent as to necessitate the establishment of throwing mills in the immediate neighbourhood of the manufacturing industry. The economies resulting from the localisation of the throwing industry in the reeling districts more than counteract the disadvantages of preparing the raw material far from the consumer.

The causes which led to the localisation of the manufacturing division of the silk industry in different parts of Great Britain are somewhat obscured by the diversity of the economic conditions under which the process of localisation has taken place. There is no other branch of the textile industries which is so widely distributed over the country as the silk industry. In almost every other textile industry it is possible to discover quickly the causes which influenced the centralisation or decentralisation of its individual branches, but in the silk industry the discovery of such causes involves a thorough investigation of the economic conditions under which the industry is practised in each area. Under these circumstances we can give only some of the general causes which led to the dispersion of the silk-manufacturing industry from its original centre and to its localisation in other places.

The early localisation of the weaving industry in Spitalfields was undoubtedly due to the immigration of Flemish and Huguenot weavers in the sixteenth and seventeenth centuries. The foreign immigrants, who had already specialised in the art of silk weaving, soon settled down in or near Spitalfields and, by the end of the seventeenth century, established a silk-weaving industry in this locality. It seems to us that the silk-manufacturing industry remained concentrated in Spitalfields and London for over a century,

and it was probably during the last two decades of the eighteenth century that its gradual dispersion commenced. It is generally believed that the first three centres to which the industry was shifted in its early stage were Macclesfield, Coventry and Norwich. But it is impossible to explain the causes which led to the localisation of the manufacturing industry in all of these centres. It is clear, however, that the development in the methods of production, together with the introduction of automatic machinery in weaving, dyeing and finishing exercised considerable influence on the localisation of the silk industry in the beginning of the nineteenth century. Moreover, the woollen and the cotton industries had already attained perfection, and had localised themselves in Yorkshire and Lancashire when the silk industry commenced its dispersion. The localisation of the cotton industry in particular, resulted in the establishment of subsidiary industries, such as the manufacture of textile machinery, which contributed to the subsequent prosperity of the mechanical engineering industry in Lancashire. The manufacture of silk fabrics required power looms which were somewhat similar to those used in cotton weaving or at least were worked on a similar principle, and so the silk industry could not find a better seat than the borders of Lancashire or Yorkshire where it could be supplied with machinery by the neighbouring manufacturers of textile machinery. This line of argument can explain only one phase of localisation, that is, the localisation of the weaving, dyeing and finishing industries in Macclesfield, Bradford, and other localities which are situated within the range of influence of the cotton and woollen industries.

Those particular aspects of localisation which explain the presence of the silk industry in such towns as Coventry, Yarmouth, Derby, Nottingham and Glasgow are very difficult to explain. This difficulty arises mainly out of the difference in the general economic conditions of these places, and also out of the difference in the nature of the influences which have caused the partial localisation of the silk industry. In the absence of a definite knowledge of the circumstances which are likely to explain the causes of localisation, we

might suitably draw some useful conclusions from the operation of those factors of production which are common to all the textile industries. One of the most important among these factors is a requisite supply of suitable labour. It is well known that the textile industries are peculiarly susceptible to labour conditions, as, in order to achieve success, they must be near an abundant supply of labour which is capable of acquiring efficiency in the manipulation of delicate textile fibres. It is thus probable that the silk industry, during the process of localisation, found favourable labour conditions in Coventry, Yarmouth, and other scattered areas where it established itself ultimately. Other important economies, such as those resulting from a cheap supply of power, lower local rates and easy transport, must have played their part in the localisation of the manufacturing branch of the silk industry in different areas, but as the history of their early influences is not known, it is best to leave them out of account for the present.

Let us consider now the causes of localisation of the silk-spinning industry. As we have already observed, this is the dominant branch of the British silk industry, and is at present concentrated chiefly in the central area, which includes the western part of Yorkshire, the eastern part of Lancashire, the northern borders of Staffordshire, and two important towns (Congleton and Macclesfield) in Cheshire. This concentration of the silk-spinning industry shows that its development took place within the range of influence of the other textile industries. It is most probable, therefore, that the localisation of this industry was greatly influenced by the advantages which the cotton, woollen and worsted industries offered. At any rate, it is evident that the economic conditions which accelerated the localisation of the cotton industry in Lancashire and that of the woollen and worsted industries in Yorkshire, played, later on, a very important part in the establishment of the silk-spinning industry in the central area. Following the present line of argument, we shall now examine the dominating factors which rendered possible the localisation of silk spinning within or near the main textile area.

First of all, it must be remembered that the silk-spinning industry is much younger than the cotton spinning and the woollen industries. It is believed that the first mill for spinning silk yarns from waste silk was established in the year 1792, at Galgate, near Lancaster, by the still existing firm, Messrs. W. Thompson & Co., Ltd.¹ The causes which led to the commencement of silk spinning in Lancaster are not known, but this is certain, that within about forty years of its life this industry had established itself in Congleton, Macclesfield, Huddersfield and Manningham, near Bradford. In those days silk waste was worked on the cotton system; the waste was first cut into short lengths of $1\frac{1}{2}$ to 2 inches staple, was then carded on ordinary circular "carding engines" and put through drawing and rolling frames on the roller, as opposed to the modern "gill" system. This short staple of the silk fibre admitted of its being spun on mules just like cotton, so that it was possible to use the cotton-spinning machinery for silk spinning as well. Owing to the similarity of processes, the neighbourhood of the cotton-spinning centres presented several attractive features of industrial importance, which exercised considerable influence on the localisation of the silk-spinning industry. It might be assumed, therefore, that the group of advantages² which induced the localisation of the cotton industry rendered, at a later stage, great service to the cause of the silk-spinning industry, and played an important part in its localisation.

After the establishment of the silk-spinning industry in Congleton, Bradford, Halifax, and other places in the central area, its internal development began to follow independent lines. A great revolution took place in the spinning processes about the middle of the last century, and the original

¹ This information is contained in a paper read by Mr. Joseph Boden, at the Annual Meeting of the Silk Association of Great Britain and Ireland, held on February 15th, 1905.

² Professor Chapman, in his "The Lancashire Cotton Industry," explains fully the causes of localisation. The following passage from his book might be quoted here: "With its humid atmosphere, its coal and its harbour, its climate rendering an indoor occupation desirable, and its general unsuitability for agriculture, Lancashire is marked out as a spot exceptionally well endowed for the prosecution of the cotton industry." See p. 153.

process of "short spinning" was displaced by a new process which was named "long spinning" in contra-distinction to the former. In this process it was no longer necessary to cut the silk waste into short lengths prior to carding and drawing. The principal feature of the new process was the displacement of "carding engines" by "dressing frames," an improvement which facilitated the working of silk waste in long staples of 3 to 9 inches.¹ The introduction of the spinning frames, similar to the worsted pattern, and the use of other mechanical devices hastened the mechanical advance of the silk-spinning industry, and after the year 1860, the spinning of silk waste became an independent industry.

It might be observed here that the main object in giving a brief sketch of the development of the spinning processes was to explain the causes which led to the localisation of the industry in the central area, and to point out that in its early stages the growth of the industry was entirely under the influence of the cotton industry. The original cause of what we might describe as a partial centralisation was the presence of cotton spinning, which not only presented suitable economic conditions, but also offered its experience, both industrial and mechanical, to the silk-spinning industry. As in many other industries, the later stages in the development of silk spinning acquired an individuality of their own, and the industry became independent on account of the introduction of new processes which differentiated it from cotton spinning. Its general growth and advancement, however, still remained under those economic influences which determined the prosperity of the other textile industries.

Above, we have dealt with those dominating factors which tended to induce the localisation of the silk-spinning industry in England. It is necessary to point out here that these factors apply only to the particular case of the British spinning industry and, therefore, cannot have a universal application. Considering, for instance, the causes of localisation of the silk-spinning industry in France, we find that the

¹ I am much indebted to Mr. A. J. Solly of Congleton, for giving me valuable information on the subject of silk spinning.

basis of centralisation was determined more by the nature of internal economies than by any external influences. These internal economies arose out of the spinning processes which were, from the very beginning, different from those used in the British silk-spinning industry. The fundamental difference which tended to lower the cost of production of the spun yarn by reducing the preliminary expenses, was in the process known as "schapping," that is, softening the waste silk preparatory to combing. This process involved the slow decomposition of the "gum" contained in the waste silk and necessitated the use of running water for purposes of cleaning the waste.¹ The process was undoubtedly more economical than the process of "boiling," as practised in England; but the unpleasant odour given out by the waste during the period of fermentation and the possibility of polluting the rivers by letting impure water flow into them prevented the English spinners from adopting it. Moreover, the restriction imposed by the sanitary laws in England made it impossible for the spinners to carry out the preliminary process of discharging the "gum" on the continental lines. Obviously, therefore, in France and in other continental countries where the process of "schapping" is used, the localisation of the silk-spinning industry followed lines different from those followed by the British industry. In the first place, the internal economies resulting from the use of "schapping" made it essential for the spinning industry to localise itself in the proximity of a river, and, in the second place, the nature of the process itself determined the locality where the industry could find a suitable supply of labour. These two were the principal factors which determined the localisation of the silk-spinning industry in France, Italy and Switzerland.

So far, we have endeavoured to explain the operation of those influences which determined the localisation of each of the three principal divisions of the British silk industry. We have observed that the economic factors which constitute the fundamentals of industrial success, vary with the indi-

¹ The process of "schapping" is explained in detail in a later chapter.

vidual branches of the silk industry and, therefore, the process of localisation of one branch differs from that of another according to the difference in their industrial and economic requirements. This principle of variation in the economic factors influences not only the localisation but also the organisation of the different branches of the silk industry. The form of organisation in the throwing industry, in most cases, is essentially different from the form of organisation in the manufacturing and the spinning branches of the industry. This difference, again, is due partly to the economic evolution of the industry itself and partly to its industrial requirements which demand an individual form of organisation. Our next problem in the present chapter is to examine in general the various forms of organisation which arise out of the individual economic characteristics of each branch of the industry.

It will be of some interest to observe, in the first place, that the industrial organisation of the British silk industry exhibits only a limited number of individual features owing partly to the scattered nature of the industry, and partly to the decline in the number of businesses. The separation of functions which characterised the organisation of the industry before the beginning of the present century has gradually disappeared and, at the present time, either the throwing, manufacturing and spinning processes are carried on as individual businesses or they are all combined into one by some of the leading firms. In former years, when most of the manufacturing firms used British thrown silks, throwing flourished as an independent branch of the silk industry and its activities were centralised most at those places where there was a constant demand for thrown silks. But now, the number of independent throwing businesses is very small, and, in view of the fact that, the continental throwing mills, owing to favourable labour conditions, can supply the British manufacturers with thrown silks at prices lower than those at which the home throwsters can supply, a large number of throwing concerns in this country have retired from business. There are, however, small manufacturers in Macclesfield Derby, Nottingham and in the neighbourhood of Manchester,

who cannot afford to add a throwing plant to their works, and at the same time do not rely on foreign thrown silks, and therefore place their orders with those local throwsters who still carry on their business. In these cases the success of throwing as an independent business depends very largely on the extent and continuity of the demand for thrown silks, for obviously the manager of the throwing mill is always anxious to see that the machinery standing idle is a minimum, and the period of its idleness is also a minimum. In the case of large manufacturing firms, it is generally deemed advisable to add a throwing plant to their works, as it is possible to produce yarn practically at the same price as the foreign throwsters would charge. But it must be remembered that this combination of throwing and manufacturing is profitable, owing, firstly to the utilisation of the same power plant for all the departments of the factory, and secondly, to the constant demand of the weaving department for thrown silks. It is therefore the internal economies of production on a large scale which render possible the combination of throwing and manufacturing in one business. Taking a general survey of existing conditions, we can only say that throwing and manufacturing are united only in the case of large firms, while the small firms either import their thrown yarn from France and Italy, or receive their supplies from those throwsters who still exist as independent units of the British silk industry.

In France the division between throwing and manufacturing is quite distinct. Owing to its association with the reeling industry, the throwing industry not only exhibits a form of organisation different from that of the manufacturing industry, but also determines its own separate functions. In the first place, the economic conditions which prevail in the reeling districts influence the form of organisation of the throwing industry, and separate it from the manufacturing branch of the silk industry, which is concentrated mainly in Lyons and St. Etienne. In the second place, the growing importance of the export trade in thrown silks tends to introduce the spirit of specialisation in the throwing industry. The first factor which relates to the suitability of economic

conditions tends to identify the organisation of the throwing industry with that of the reeling industry in almost all respects, and the second factor, which refers to the enlargement of foreign markets for thrown silks, renders possible the organisation of the French throwing industry as an independent and centralised business. Thus we find that in France the throwing and the manufacturing industries are only rarely united ; as a rule there is a distinct division between them.

Let us consider now the organisation of the manufacturing branch of the silk industry as distinct from the organisation of the other branches. The most important aspect of manufacturing is weaving, the organisation of which exhibits various stages of transition, some of which have survived even till the present day. The first characteristic form of organisation which prevailed in the British silk industry before the ratification of the Cobden Treaty with France in 1860, was the cottage industry system. In the days of its prosperity the silk-weaving industry in England and Scotland was practised mainly in the homes of the weavers. There were a large number of weavers who worked either independently or on commission in Spitalfields, Coventry, Macclesfield, and in the suburbs of Glasgow. The system on which the organisation of these cottage factories was based was described by one of the witnesses before the Tariff Commission in the following words :—

“ These cottage factories were generally built to hold two or three looms, and generally the husband, wife, or eldest son or daughter used to attend to the two or three looms, and the younger children used to fill the quills of silk, or pick up (clean) the silk while the looms were working. This was an ideal life to live, and under the very best conditions, healthy and clean. There were quite as many people employed outdoors in the cottage factories in the suburbs and villages as in the factories—I should estimate about 15,000 men, women and children. In the winter the workers were employed in making up summer coloured goods ready for the spring trade, and I have seen enormous stocks of ribbons piled up

at my father's warehouse made during the winter—as much as £50,000 worth.”¹

This extract is of special interest in so far as it describes the manner in which labour was organised in the days of the cottage industry system. The weaver's family formed the labour force in the cottage factory and each member of the family represented a particular function according to his or her working capacities. The simple division of labour, which characterised the system, resulted in certain economies which contributed to the success of the cottage industry. Moreover, the existence of a cottage industry offered additional facilities of production to those manufacturers who did not possess sufficient capital to enlarge their own factories. Thus the weaver could either produce and finish goods independently and sell them himself, or work on commission for a small manufacturer.

The cottage industry system flourished so long as the British silk industry was protected against foreign competition. The cottage factories began to disappear soon after the free entry of cheap foreign goods into British markets and the hand loom, which played the most predominant part in silk weaving, could no longer resist the attacks of the power loom. In order to compete with, or at least to hold their own against the continental manufacturers, the British manufacturers concentrated the silk-weaving industry in large factories which they equipped with the latest types of power looms and Jacquard machines, and by securing control of power and other internal economies they succeeded in establishing the silk industry on modern factory lines. Thus the old cottage industry system was transformed into the modern factory system, owing partly to the introduction of new mechanical devices, but mainly to the need for economical production on a large scale, which was in fact created by the influence of foreign competition.

As we have stated in a previous chapter, the hand loom branch of the British silk industry is now practically extinct in most places. There is only a limited number of hand-loom

¹ The above extract is taken from the “Report of the Tariff Commission,” Vol. II., Part VI., published in 1905.

weavers employed at the present time by some manufacturers on work which cannot be done by the power loom. In the manufacture of high class tie silks and certain other rich fabrics, multiplicity in the form of design and finish can only be executed on the hand loom and, therefore, in the production of "specialities," the services of the hand-loom weaver cannot entirely be dispensed with. Although the introduction of weaving by the "Jacquard" loom has greatly affected the position of hand-loom weaving in certain branches, the silk industry has retained the human element even till the present day.

One of the interesting features of the French silk industry is that it still retains its cottage system. In St. Etienne and its surrounding country, and in the hill districts of Haute Loire, the silk-weaving industry is organised on the system of small workshops. The working members of the family form the *personnel* of the "factory," and the father or the eldest son undertakes the task of management. These small cottage factories either work independently or are engaged by "manufacturers" who have no factories of their own. The system is identically the same as that of the old English and Scottish cottage factories. The reason for the survival of this system in France is that electric power can easily be adapted to the low web looms required for making ribbons, without any great changes in the machinery or any special reconstruction of the workshop. A small motor is added to give power, and complications of any kind are avoided.

On the other hand, in Lyons, where the manufacturers of piece goods require rebuilding of the whole loom for fitting new appliances, the weaving branch of the silk industry is organised on the factory system. An individual weaver cannot incur great expenses both in the purchase of the loom and the supply of power, and for this reason he is led to find employment in large factories, which have been built up by joint stock companies or private capitalists. In this respect the organisation of the Lyons silk industry resembles that of the British industry which, at the present time, receives its motive force either from the joint stock or from private enterprise. It is, however, the maintenance of the cottage

system which gives the French silk industry a decided advantage over the British silk industry, as a combination of the two systems not only enlarges the scope of production, but also preserves an institution which is specially suited to industries in which simple machinery can be run by a comparatively low horse-power motor without much disturbance in the workers' homes.

In addition to weaving, the manufacturing branch of the silk industry also includes dyeing and finishing, both of which are common to the other textile industries as well. In Great Britain these two functions of the silk industry are, as a rule, separated from weaving ; only in special cases the silk manufacturers have combined weaving, dyeing and finishing. The combination of these processes depends largely on the size of the manufacturing house, and partly on the distance of the weaving factory from the dyeing and finishing centres. It is obviously easier for a large firm to add the necessary equipment for dyeing and finishing to its weaving factory than for a small firm, as in the former case, the output of woven goods is generally large enough to keep the dyeing plant busy throughout the year. Again, if a large weaving factory is situated at a great distance from the dyeing centre, the manufacturers find it cheaper to invest additional capital in the establishment of a dyeing and finishing plant than to send the woven goods to distant places. The small manufacturer, however, finds it more convenient and more economical to send his goods to the local dyeing and finishing houses. But this procedure is possible only when the weaving and the finishing factories are situated within the same area, or otherwise the increased cost of transport would raise the cost of production of the finished goods to such an extent as to reduce appreciably the manufacturers' profits.¹

As the dyeing and finishing industry forms an important individual branch of the textile industries and thus demands exclusive attention, we shall be justified in refraining from further details of its organisation. It will be of some interest

¹ The above statement is based on the assumption that the manufacturer does not raise the price of his goods.

to consider at this stage the particular aspects of specialisation in the manufacturing branch of the British silk industry. It must be remembered that specialisation is a prominent feature of the organisation of this industry and is based entirely on the division between the various classes of finished commodities. Even in weaving there is a marked distinction between the manufacture of broad silks and the production of ribbons and other narrow-web goods. The former is not only divided into crêpes, crêpes-de-chine, and muslins, but also includes tie silks and other plain silks for shirtings and blouses. Again, the manufacture of laces, nets and veilings represents a specialised form of business which has its own individuality. The manufacture of silk fringes, braids and trimmings requires special machinery, and thus forms a distinct division of the silk industry. From the point of view of industrial organisation, each of these divisions may be regarded as an independent unit of the silk manufacturing industry. The manufacturer who specialises in broad silks does not produce ribbons or laces, or braids and trimmings, but simply adheres to his particular division and produces as large a variety of goods in that division as possible. In a similar way, the manufacturers of ribbons, braids and trimmings specialise in their respective trades and produce goods of various grades and qualities in their own divisions. Thus on the industrial side, the silk industry enjoys the advantages of specialisation which arise, firstly, out of the distinction between the finished commodities, and secondly, from the difference between the processes of manufacture. Each of the divisions mentioned above requires a particular type of machinery and a particular class of labour, and, therefore, it is usually more profitable to the manufacturer to specialise in the manufacture of one class of goods than to divide his factors in production among various commodities without specialising in any one of them. On the one hand, the industrial organisation becomes simple as a direct result of specialisation, and on the other, the processes of manufacture acquire perfection through the exclusive devotedness of the organisers and workers to one particular function of the silk industry.

Leaving aside the manufacturing branch for the present, we shall touch upon the organisation of the silk-spinning industry. Unlike weaving, spinning has always remained in the factory owing to the requirements of machinery. The preliminary processes of discharging the "gum" from the waste silk and combing can be performed only in a well-equipped factory, and, therefore, even in its earlier stage, the spinning industry could not be practised on the lines of the cottage system. The secondary process of spinning requires the use of high-speed spindles, and the final process of cleaning and finishing the yarn requires the use of gas burners ; both of these processes are complicated and cannot be conducted without the help of specialised machinery. It is therefore the nature of the spinning processes which kept the spinning industry in the factories and rendered possible only one form of organisation which is common to the spinning branches of the other textile industries, and does not need any special comment.

We might observe here that in England the silk-spinning industry is either under private proprietorship or under limited companies. There is no combination among the spinners in so far as the control of the raw material and the prices of the finished yarns are concerned. The spirit of "free competition" prevails throughout the industry. On the other hand, in France the spinning industry is now more or less a limited monopoly. Several of the leading firms have amalgamated into one large company to form a syndicate. This syndicate controls the purchase of the raw material as well as the sale of the spun yarns. The working of this corporate body is based on the definite policy of cheapening production and preventing free competition. Although the directors of the individual companies, forming the combination, control their own establishments, matters concerning the whole industry are discussed at the Board of the syndicate. In Switzerland the spinning industry is controlled almost entirely by a powerful company known as the *Société Industrielle pour la Schappe*, which is one of the most important producers of spun yarns in the world. It appears that the system of combination was adopted by the

continental spinners as a measure of protection against outside attacks which threatened the prosperity of the spinning industry in the early years of its establishment ; though its extension, that is, the further combinations of different firms of dressers and spinners, was due principally to the success of the original concern.

As regards the separation of functions in the British silk industry as a whole, we have already indicated that in some cases, throwing forms an independent branch, in others, it is combined with manufacturing. Here, it will be interesting to note that, in a very few cases indeed, manufacturing and spinning are combined. As a rule, spinning is separated from manufacturing owing chiefly to the advantages of specialisation enjoyed individually by these two branches of the silk industry. In the first place, it is extremely difficult for a managing director of average ability to conduct the spinning and manufacturing businesses at the same time. Even under the best conditions an organiser can specialise in one branch of the industry only, as that one branch is full of so many ramifications that it takes a long time to master them all. For instance, in spinning, the organiser is concerned with the choice of the raw material, the quality of the discharged waste silk, the operations of combing and roving, the spinning and finishing of the yarn, and finally, with the markets for the finished spun yarns. In order to maintain the efficiency of organisation, the managing director must be thoroughly acquainted with the details of the various processes of manufacturing, and if his attention is divided between spinning and manufacturing, it is very probable that he will cut a sorry figure in his position. The vast difference which exists between silk spinning and silk manufacturing keeps them apart from each other and, ultimately, the need for industrial specialisation becomes so prominent that a combination of the two branches seems impracticable except under special circumstances.

In the second place, the investment of capital increases with the increase in the number of independent branches of the silk industry practised in a factory. The throwing branch requires a special plant and so does the spinning

branch, both of which are different from the weaving, dyeing and finishing branches. For this reason, only large firms having unlimited capital at their disposal can combine these branches. There is no doubt that a combination of throwing, manufacturing and spinning results in certain internal economies, such as the utilisation of the central source of power for all the processes, and the utilisation of the winding and throwing wastes within the same premises ; but considering that such a combination is possible only under a strong financial protection and is detrimental to the interests of the small manufacturer, we cannot but say that the separation of the individual branches of the silk industry from each other is conducive to the prosperity of the industry as a whole.

We have discussed in the first part of the present chapter the operation of those influences which induced the localisation of the three principal branches of the silk industry. In the second part, we have shown how each branch plays its part in the system of industrial organisation of the silk industry, and how each is related to the other in so far as the separation of functions is concerned. We have indicated that the reason for industrial divisions lies in the advantages of specialisation, and that the ultimate success of a particular branch depends on the efficiency of its organisation. So far, we have considered the industrial organisation from the point of view of general economic interest, without touching upon those of its aspects which are associated with the economies resulting from the best selection of the raw material. It must be noted that under favourable economic conditions, the quality of the raw material used in manufacturing determines the quality of the finished product, and, therefore, in the scheme of industrial organisation the most suitable selection of raw silk is a function which commands the attention of the organisers. In the next two chapters we shall consider the problems connected with the consumption of the raw material in their relation to the demands of the manufacturing and spinning industries.

CHAPTER XVII

THE RAW MATERIAL

FOR

(a) THE SILK-MANUFACTURING INDUSTRY

WE have already indicated that the fundamental basis of internal economy in the silk-manufacturing industry, when other conditions are normal, is the proper choice of the raw material. The significance of this condition is realised only by the manufacturer who is the actual consumer of raw silk, and whose final success in manufacturing depends, to a large extent, on the quality of the raw silk he uses for the manufacture of a particular class of goods. But, for the economic interests of the silk industry as a whole, it is essential that the producers of raw silk should be fully acquainted with the exact nature of the demand in the manufacturing branch. Thus viewed, the subject acquires a still greater significance, and its object becomes twofold. In the first place, it requires the exact determination of the manufacturer's demand, and in the second place, it leads the producer to a realisation of the consumer's demand. Therefore, in considering the nature of economies which result from a proper choice of raw silk, and in analysing the defects in the raw silk which force obstacles into the manufacturer's way, we shall perform two functions at the same time.

It might be pointed out at the very outset that the present problem involves a large number of difficulties, and demands an exclusive survey of some of the technical details. It is well known that the raw silk fibre is very delicate to manipulate, and in so far as it has to pass through a number of processes (from winding to weaving) before it is converted into a finished commodity for the market, and in so far as it has to undergo the tension of machinery, its quality and its power of undergoing considerable torsion are matters of vital

importance to the manufacturer. It is therefore obvious that one cannot solve the problem relating to the choice of the raw material without referring to the essential manufacturing processes. In order to explain the economic importance of the problem before us we shall consider the quality of raw silk in relation, firstly, to the nature of processes, and secondly, to the nature of commodities manufactured. The best way of attacking the first part of the problem would be to consider it in its negative aspect, that is, to consider the defects which are commonly found in the supplies of raw silk imported from the silk-producing countries.

Before dealing directly with the first part of the problem, we shall enumerate here the various kinds of raw silks used in the British silk industry. The whole supply may be divided into European "raws" and Asiatic "raws." The former group consists of Italian and French silks; the finest qualities of which are known as "Classical" and "Extra Classical" in this country. All these silks are filature-reeled, and possess the qualities of good "raws," except some, which are known as "Common." Comparatively speaking, very little European raw silk comes to this country owing to the fact that the demand in the home market is, as a rule, sufficient to absorb most of the supply and keep up the prices. As we have stated in a previous chapter, thrown silk is largely imported into England from the Continent for a very high class of goods, on account of its relatively cheap cost and fine quality. In some cases "singles" are also imported for special purposes.

Among the Asiatic countries Japan and China are the largest exporters of raw silk for the British market. Raw silk from the former country comes in different grades, commercially known as Extra No. 1, No. 1 to $1\frac{1}{2}$, No. $1\frac{1}{2}$ to 2, and No. 2. Under this general classification there is another complicated form of sub-classification which represents the respective chop marks of different filatures. The colour of Japanese raw silks is generally white, and, in some cases, greyish white, as compared with the yellow of the European silks.

The raw silk imported from China is divided into three

classes, each class being named after the method of reeling. "Tsatlee" is the commonest and oldest form in which the China raw is imported into this country, and is commonly known as "Tsatlee Reel." It is a very primitive kind of reel and shows a certain amount of inconstancy in size. The different grades vary from No. $2\frac{1}{2}$ to No. $5\frac{3}{4}$ without any definite classification, either under these grades or under the main class. The shippers style them according to their own recognised standard, and there are about thirty or more chop marks known in the trade and found in the lists published by the exporters.

The next class, which is known as Re-reels, is much superior to the former, owing to the re-reeling process and improvement made by a subsequent process of cleaning. Its name denotes the recurrence of a process in which bad pieces and other defects are more or less rectified. The skeins are sorted and sizes graded so as to introduce a greater uniformity than is found in the "tsatlee." Like the former, the re-reels are also divided into grades, and are shipped under a chop mark which denotes the quality of that particular kind. This system of classification is misleading, and cannot be relied upon even by those who have been accustomed to it for a long time.

The finest quality of China silks is known as Steam Filatures. These are reeled on most modern lines, and in these there is much more uniformity of size than in either of the two classes mentioned above. The reeling operations are carried out under skilled supervision and in a centralised system, in which great care is taken to secure the maximum uniformity of size and length of skein. This kind of silk finds great favour in the British market, and, in spite of its expensiveness, it is largely used in the manufacture of silk fabrics. This is also sold under chop marks which, in some cases, represent the name of the filatures, in others are only arbitrary names.

These silks are all imported through Shanghai, and are universally known as "Chinas."

There is another class of raw silk which is imported from Canton, and largely used in this country for cheaper goods,

This is quite different from "Chinas" both in quality and price, and the demand is limited to coarser work where very fine thread is not required. There is a vast difference in colour, texture and touch between the Chinas and Cantons. While the former are pure white, the latter are comparatively dirty, and do not possess the firmness of the Chinas whose thread is strong and compact. The Cantons are fluffy, and cannot be used for the manufacture of goods in which a pure white bottom is desired. These are shipped in the same form of reel as the Chinas.

In addition to the Asiatic silks mentioned above, Bengal raw silk was formerly largely used in this country, but now it has fallen into disfavour owing to the phenomenal increase in production and improvement in quality of Japanese and Chinese silks. There is no continuous importation now; only small quantities occasionally appear in the market. Moreover, the supply is too small to meet a regular demand in the consuming market. The distinguishing feature of Bengal raw silk is its bright yellow colour and its soft and spongy nature which makes it suitable only for a limited number of manufactures. These silks used to be shipped under different names, such as the Soleil, Surdas, Rose Filature (known by the same name even at present), and Chandpores, etc., but it seems to us that during recent years, even the favourite marks have disappeared from the market, and at present, although there is a demand for them in certain manufacturing circles, the supplies are not forthcoming.

Before the war, Near Eastern silks such as white Broussa and Syrian silks were also used to a small extent in this country. They were regarded as best suited for certain high-class trades. But on account of the cessation of all communication with those countries during the war, no more supplies have been received in the market and their place has been largely taken by the yellow Italian silks.

In recent years, Kashmir raw silk has also been used by three or four silk manufacturers. Its superiority to Bengal silk and its good qualities have made it fairly popular, but on account of its supply being comparatively small and its

consumption on the Continent being large, the British manufacturers have not had the full opportunity of giving it a good trial. Its colour is yellow, but not as yellow as that of Bengal silk. It is imported into this country through Bombay, and is sold under two or three distinct grades.

Mysore silk has also been used from time to time in this country, but on account of a very limited amount exported, it has not been advertised in the manufacturing areas. There is no doubt that this kind of raw silk, which is of a light greenish white shade, would find a considerable market if production were increased to such an extent as to export large and continuous quantities of it to foreign countries.

After having obtained a knowledge of the kinds of raw silks used in the British silk market, we are in a position to attack the first part of our problem. As we stated in a previous paragraph we shall discuss the problem of the choice of the raw material in its negative aspect, that is, we shall investigate the defects which are commonly found in the raw silks imported into this country, and which have a direct economic bearing on production. With regard to European supplies, it is unnecessary to examine their qualities or defects, as in the first place, their limited importation prevents inferior grades coming into the market, and in the second place, the improved methods of production which follow the application of science do away with those difficulties which arise in the course of manufacturing processes, and give results in the highest degree satisfactory.

We have now to turn our attention to Asiatic raw silks and examine their chief defects which make them unsuitable for working purposes and deteriorate their commercial value. In order to present an economic analysis of the subject in question we shall divide these defects of raw silk into three groups; those which influence the quality of the manufactured product, those which affect the cost of production, and those which limit the scope of its utility.

Those defects which affect the quality of the goods produced may be subdivided into two heads, lack of evenness and want of cleanliness. The former is represented by fine and coarse threads, and is a result of the neglect of the reeler

who fails to nourish the thread with the necessary cocoons, and, after discovering that the thread is running fine, adds several fibres at once, with the result that the superfluous ends increase the diameter of the thread to an appreciable extent, and during the process of cleaning are at once caught by the cleaner. An excessive number of fibres causes coarse threads and double cocoons bring about a similar defect. Thus there is a lack of uniformity in the size of the resultant thread, in other words, there is a deviation from the mean denier on which the raw silk is sold.

This defect is very serious and badly impairs the quality of the goods produced. When a manufacturer puts on the market a distinct brand of cloth under a specific trade mark, he is expected to produce a uniform article throughout the season, and to do this he must have a uniform stock of the raw material, otherwise it would be impossible to obtain uniformity in the finished commodity. In estimating the final weight of the cloth a manufacturer calculates on the denier,¹ *i.e.*, so many ends in the warp, and so many picks per inch in the weft should give a certain weight of cloth per yard. But when the variation in the initial fibre is too much there is a considerable loss and inconvenience in the process, and sometimes the finished goods have to be sold as defective, which means that material of a high grade has to be offered on the market as belonging to an inferior grade.

Next comes cleanliness, lack of which renders the quality of the manufactured product unsatisfactory, and makes it unmarketable under the grade in which it is intended to be sold. The lack of cleanliness is represented by the following defects: Bad knots, waste fibres sticking to the thread, nibs, slugs and split ends.² It is difficult to give these defects any technical names, but as a matter of convenience, the above mentioned will serve the purpose.

As a rule, a commercially good skein of raw silk is considered to be of continuous length knotted together by short knots, about $\frac{1}{10}$ th of an inch or shorter. When these knots

¹ One denier is equivalent to the weight of 450 metres of the silk thread. For full explanation of this term, see Chapter XXI.

² These names are well known in the trade.

become larger in size they appear to be a defect and should be avoided in the reeling process as far as possible. A bad knot seriously affects the rate of throwing and causes considerable inconvenience in manufacturing. Sometimes these knots are made in re-reeling the skeins dry, and about 40 per cent. of them break out in the process of throwing.

The loose formations on the thread spreading out in all directions may be regarded as waste. These formations of the waste silk are very troublesome and about 30 per cent. break out in throwing; those that still remain on the thread appear finally on the surface of the cloth or on other goods made from thrown silks containing them. Larger portions of waste are found in the lower grades of "raws." Small flossy filaments sticking to the thread are known in the silk trade as nibs, and those that are large or oblong are called slugs. The latter appear more numerous on silks of a "harder nature," and are not removed in throwing. They show very badly in the dyed state and form a serious handicap in the preliminary processes, in addition to showing soft brushy filaments on the smooth surface of the manufactured goods.

All the above defects (if not removed during the process of cleaning) diminish the value of the finished commodity, especially in the higher class of goods, in which the excellence of the article depends upon the quality of its finish, and in which perfection in manufacture determines the price.

Let us consider now those defects which increase the cost of production and affect the preliminary and important processes of winding and throwing. The present-day tendency of the British manufacturer is to emphasise two things strongly, (a) the speed with which silks can be wound, and (b) the amount of waste made in throwing, because with every unit of time lost in preparing the raw silk for the loom the cost of producing a particular commodity rises in proportion to the increase in the labour charges. Moreover, if the wages are paid on the piece-rate system the winders complain of the raw silk given to them for winding.

For purposes of classification, those defects which directly

affect the cost of winding may be named as follows : large gumtacks, presence of a large number of split ends, loops, corkscrew threads, many slugs, large knots, double ends, etc. ; while those that indirectly affect the same and also cause poor winding are lack of uniformity, irregular form of reel, and ineffective lacing.

These defects impair the efficiency of the winder in various ways ; for instance, when the silk has been reeled in such a way as to form masses of gum where the skein rests on the reel arms it is difficult to soften these spots and keep them soft until the skein can be unwound. The gum marks therefore cause frequent breaks, and often the silk is spoiled by the frequent touch of the fingers, which is necessary to free the thread so that it will unwind without trouble. Sometimes more soap and warm water are required for the simple process of softening the silk, and hence there is greater complication apart from the extra increase in the cost of winding. Thus poor winding affects the output of the throwster and decreases the wages of the worker.¹

Slugs, knots and waste cause trouble in another way, they catch the thread and when running fast break it, especially when the skeins are large and heavy like those of Cantons. Double ends, split ends and loops are often several yards long, and cause a great amount of waste because they must all be removed and discarded.

Ineffective lacing and insufficient and irregular crossing of the thread in the reeling of silk from the cocoons or in the re-reeling cause the thread to be tangled and break, and also add to the waste produced in throwing. In other words, bad form of the reel and other defects in its preliminary manipulation, such as lacing, etc., cause unnecessary waste of time and labour. If, in addition to these defects, the thread happens to be sticky, then the result is an extremely poor winding.

Lack of uniformity in size is such a serious defect that besides affecting the quality of the manufactured product, it raises the cost of production as well. It affects first of

¹ The winder is paid at a piece-rate, wages varying from 15s. to 25s. in ordinary times.

all, winding, and then throwing. A raw silk thread which contains many fine and coarse parts will break in the fine places. The swifts, upon which the skeins are held, automatically stop, and the ends have to be tied together again to continue the process. The larger the number of breaks the more is the time lost in winding, and hence a poor output and less wages for the winder.

When the skein passes to the next stage of manipulation, that is from winding to throwing, it has to be transferred to suitable bobbins for the throwing machinery. An intermediate process is that of cleaning, in which the thread passes through two cleaning knives. As the thread passes through these steel knives, the presence of any knot, nib, or coarse thread is immediately detected, and by means of a simple automatic arrangement the receiving bobbin is stopped. These faulty pieces have then to be taken out and thrown as waste. Here, again, we have an extra loss of time as well as waste of good silk which would otherwise have formed part of the real material. In other words, there is an increase in the cost of production which is felt still more in the process of throwing the silk.

It must be remembered that the process of throwing involves the use of high-speed spindles, the speed of the vertical bobbins varying from 5,000 to 10,000 revolutions per minute according to the twist desired in the thrown thread. Moreover, the thread has to stand a considerable tension while passing from the vertical to the horizontal spindles. If the silk of a given size is set at a certain speed, and if, owing to the finer pieces in the thread, it breaks very often, it naturally impairs production and increases the cost. Calculations are generally made on the denier basis, and the process is regulated accordingly. Uniformity of size is therefore an essential factor and its absence affects nearly all the economic phases of the industry.

It might be observed here that the rate of progress of work in the manufacturing branch of the silk industry is determined to a great extent by the rate of progress of work in the throwing mills. We have already remarked that a silk manufacturer, under the present conditions of varying

demand,¹ cannot afford to keep his looms idle, and as the working of his looms depends on the supplies of thrown silk available at a particular period, it is essential that the throwster should be in a position to keep in pace with the activities of the manufacturer. And as the output in a throwing mill is governed by the quality of the raw material used, the throwster is inclined to buy only those raw silks which give highly satisfactory results in the winding and throwing processes.

The other defects which indirectly affect the cost of production and are not very serious, are moisture, the amount of gum (that is, the loss in "boil off") and "condition," by which is meant the tenacity and elasticity of raw silk. As a matter of fact, the amount of moisture contained in the silk is determined by the Conditioning House before the supply is sent to the manufacturer, and hence matters little to him.

The loss in "boil off," which is determined by the amount of natural gum contained in the raw silk is a matter of somewhat minor importance. It is considered to be serious only in those cases in which the loss is very heavy and affects the final yield of the thrown silks. As this feature is presented more or less by almost all raw silks, the manufacturers do not pay much attention to it. From 18 to about 23 per cent. is commonly found in all classes of good "raws," but if it rises beyond that up to 30 per cent. it becomes a depreciating factor and slightly raises the cost of production of the manufactured commodity.

Tenacity and elasticity are factors which enter into our present discussion in two ways, firstly, by affecting the cost of production and, secondly, by influencing the quality of the manufactured goods. For instance, if a raw silk thread is brittle and tough instead of elastic, it behaves differently in the loom, and produces unsatisfactory results. It "fluffs up" in the havel and spoils the cloth, which finally means a loss to the manufacturer. The working expenses for that particular commodity are increased, and sometimes trouble

¹ The seasonal demand for a particular class of silk fabrics. This demand varies with the fashions of the season and thus necessitates quick production of goods.

is caused in the finish. But mainly the effect of these two factors is extended to the third part of our subject, that is, the consideration of the utility of raw silk.

Before passing to the third part, we shall summarise the above considerations in order to show how raw silk is organically connected with its manufactures, and how the choice and selection of the raw material is the most important part of the business of the silk manufacturer under the existing industrial and economic conditions in Great Britain.

First of all, we have before us the complicated problem of wages, which is becoming more and more difficult every year. The British manufacturer has to work under changing circumstances, and has to meet the competition of other industries in the British labour market, and therefore, owing to high labour charges, he is no longer in a position to pay high prices for his raw material. Secondly, the current charges may rise considerably and may, in the long run, raise the total cost of production far above the normal level. Thirdly, the manufacturers are sometimes required to rush orders, and to do this they are forced by necessity to use only those raw silks which run smoothly through all the operations. It is therefore the minimum amount of delay in manufacturing that necessitates the use of raw silks involving the minimum of inconvenience in their manipulation. It is obvious from these considerations that the deficiencies in the quality of raw silk which have been pointed out previously form serious obstacles in the way of successful manufacturing, and as their ultimate burden falls firstly, on the manufacturer, and secondly, on the consumer of silk fabrics, it is necessary that the subject should receive the prompt attention of the producers of the raw material.¹

Looking at the problems of labour and output from a practical point of view, we are led to consider that poor winding reduces the amount of thrown silk which can be

¹ The manufacturer suffers owing partly to the increased cost of production and partly to the reduction in profits. The consumer of silk fabrics does not get full satisfaction from his purchases owing to the defects in the finished commodity. And lastly, the producer of the raw material obtains a much lower price for his raw silk on account of these defects.

produced in a mill, and if the plant is kept idle for a number of days without any return the situation becomes dangerous for the mill owner. Moreover, defective raw silk and consequent poor winding lowers wages ; and the winder has thus no incentive to work hard. This lack of interest on the part of the worker reacts on the stability of labour supply ; for the winders might be induced to transfer their services to another manufacturer employing good winding silks. This transference of labour limits the scope of a manufacturer who produces ordinary goods and increases activity in another firm which produces only high-class goods.

The difficulty is therefore continuous, and the defects, while increasing the cost of production, decrease the value of the finished commodity, as frequency of fine ends and uneven thread tend to produce an uneven product when they are not removed in the first few stages. But the greatest waste, from an economic point of view, is, that even if cocoons are of a good quality and are expected to give good raw silk, defective reeling deteriorates the quality of the thread ; that is to say, we have a bad economy because good cocoons render only faulty silk.

Let us now consider the third part of our problem, that is, the defects which limit the scope of utility of raw silk. These are explained by the two fundamental properties of silk, its colour and nature. We are, perhaps, not justified in calling them defects, as primarily they do not come under that category. Moreover, as there can be no universal utility for any raw material whatever, we can only say that these two properties of raw silk define the utility of various qualities and colours in relation to the requirements of particular trades. In so far as each colour satisfies the demand of its own province, its utility is positive. The same conception applies to the nature of a particular kind of raw silk. It may be suited to one trade and produce the desired effects, and may be discarded by another trade, so that different kinds of raw silks may be used in the manufacture of different commodities.

Silk may be divided as regards its colour into yellow and white. Each of these has particular advantages and serves

special purposes ; for instance, where a black bottom in a cloth is desired, the yellow silk works excellently well and takes all darker shades ; on the other hand, where pure white bottom is required or where light shades are preferable, the white raw serves best. The object underlying the choice of the white silk in preference to the yellow is to avoid the process of bleaching which adds an extra item to the cost of production.

With regard to the nature of silk it is difficult to give a scientific classification, as the selection depends largely on the experience of the experts who determine the "feel" or "touch" of the raw silk after other properties have been determined in the Conditioning House. Owing to a long experience in handling silk, the experts can readily find if they are dealing with a particular nature of raw. In certain cases the raw silk is soft and spongy, and lacks what the manufacturers in this country describe as "bone" in silk. Sometimes they say there is no "life" in the silk and for purposes of comparison, silk of a soft nature is described as "dead" silk. These expressions denote something more than mere elasticity or tenacity and peculiarly define the uses of the various kinds of raw silks.

The presence of "bone" in silk is considered as essential for manufacturing purposes, as a raw silk that lacks this property cannot very well stand the tension in the havel. But when raw silk is required for the preparation of slight twists and sewing silks, its soft nature is appreciated by the manufacturer. So that each silk whether "bony" or "dead" and soft has its own use, and either property limits the scope of its utility, or in other words, the quality of the raw material in each case is determined by the use which is to be made of it.

It might be interesting to observe here the effect of the difference in the economic conditions of two manufacturing countries on the choice of the raw material. For purposes of illustration let us consider the case of the French silk industry and compare it with that of the British silk industry. It must, however, be remembered before drawing any conclusions from the comparison that those defects of raw silk

which influence the value of the finished commodity and also raise the cost of production operate in a similar manner in both cases. The main point of distinction lies in the difference between the actual economic conditions under which the silk industry carries on its activities. Taking, for instance, the problem of wages, we find that the silk manufacturer in England cannot afford to pay high winding costs, and is therefore compelled to use raw silk which gives him the maximum satisfaction in winding and throwing. On the other hand, the silk manufacturer in France enjoys the advantage of the lower rates of wages, and if certain defects in the raw material raise the cost of working, he is still in a position to compete successfully with the British manufacturer owing to the great difference in the rates of wages prevailing in the two countries. It might be concluded from a review of the general economic conditions in France, and also from the fact that the current charges are lower there than in England, that the French manufacturer is not so strict in his choice of the raw material as the British manufacturer.

Another point of special economic interest in the French silk industry is the relation between the choice of the raw material and hand-loom weaving. We have observed in the last chapter that the hand loom still survives in France and plays a very important part in the production of ribbons and other high-class silk fabrics. In so far as elasticity and tenacity are concerned, the silk fibre required for these hand machines need not be so strong as that used for the high-speed machinery. In the first place, the former involve much less strain on the fibre and, in the second place, the simple construction of the hand looms admits of frequent stoppages for rectifying the defects in the raw material. In England, as also in America,¹ high-speed machinery is used extensively to obtain production on a large scale, and therefore only those raw silks are in demand which ensure a maximum of production for a minimum of cost in working. It must be noted, however, that even the hand loom does not admit of those defects in the material, which reflect

¹ In America the hand loom has now disappeared altogether.

finally upon the quality of the finished commodity, and thus deteriorate its market value. From the point of view of the selection of the raw material, the only difference in these two forms of the industry is that in the hand loom the primary defects in the raw silk are easier and less expensive to remove than in the high-speed machinery.

We have now examined the essential points which characterise the selection of the raw material in the silk manufacturing industry. We have shown how the manufacturer's choice of raw silk is related, firstly, to the nature of the working processes; secondly, to the cost of production; and thirdly, to the market value of the finished commodity. We have also pointed out that from the producer's standpoint it is necessary to improve the quality of the raw silk so as to satisfy the consumer's demand and to obtain better prices for the raw material. In the next chapter we shall examine the problems connected with the raw material used in the silk-spinning industry in order to establish the similarity of economic principles in the two main branches of the British silk industry.

(b) THE SILK-SPINNING INDUSTRY.

The problems associated with the utilisation of the waste silk, which is a by-product of the silk-producing and silk-manufacturing industries, are at least as important as those connected with the consumption of raw silk. The increasing utility of all kinds of waste silk in the world's spinning markets and the ever-growing consumption of goods made from spun yarns render the subject more interesting than before. In so far as the British silk industry is concerned, the spinning branch is of special economic interest owing, firstly, to its dominant position; secondly, to its power of resisting the foreign competition in the home market; and thirdly, to its successful enterprise in the American market. It is generally believed that English-spun silk yarns have surpassed the continental productions not only in the fineness of quality, but also in the perfection of texture and finish. This reputation, and the resulting encouragement

due to pluck and industry, have imparted a fresh impetus to spinning. There is no doubt that the mechanical advance in the spinning processes and the skilled labour have both contributed conjointly to the general progress of the industry ; but the fundamental factor, that is, the quality of the raw material, has always had a considerable influence on the quality of the final product. It is the last-named factor and the economies related to it that we shall consider in the present chapter.

It would be interesting to give here a short description of the raw material, and of the principal sources from which it is obtained. We have already observed that the waste silk is obtained during the producing and manufacturing processes, and consists of those fibres of raw silk which are unsuited for the reeling, winding, and throwing purposes. In so far as the means of production are concerned, the waste silk may be classified under four main divisions.

1. *Wastes from silkworm nurseries.*—These include, firstly, the waste silk surrounding the cocoons, that is, the first fibre spun by the worm and known in France as “blaze”; and secondly, the pierced cocoons, double cocoons and some of the stained cocoons which are all unreelable in the filature. The pierced cocoons are sometimes very rich in silk and contain from 70 to 80 per cent. of the silk fibre, though the average is nearly 60 per cent.

2. *Wastes from filatures.*—This class of waste is very important, and exceptionally abundant. It is formed during the process of reeling the thread from the cocoon and consists of long and loose fibres mixed with cocoon husks. Its mean production in reeling is about 25 per cent. It is commonly known as “frison.” The French, Italian and the Spanish frisons are very similar in character.

3. *Throwing and winding wastes.*—These include wastes produced during the re-reeling, winding and throwing processes, and are generally obtained from the throwing mills. In France this class of waste is known as “bourre.”

4. *Combing wastes from spinning mills.*—These are known as “bourrettes” in France and as “noils” in England, and are obtained as a by-product during the spinning processes

The staple of this class of waste is very small and for this reason the fibres cannot be spun into good yarns. They are generally used for making inferior qualities of yarns and also for spuns employed in the manufacture of cartridge bags.

We have indicated above the principal processes which yield the different classes of waste silk. This classification is based on the distinction between the processes of production and manufacture, and is adopted by the silk trade in a very limited form. According to the usage of the British waste silk trade, the various kinds of wastes are divided into two general classes: (*a*) gum wastes, and (*b*) knubs. The former class is represented by the throwing and winding wastes, and the latter consists of what is known as the cocoon waste. Generally, the latter is preferred to the former, as it is supposed to give better results in the finished yarn, but taking the industry as a whole, we may say that both are equally in use in England.

The main supply of the waste silk is imported, at present, from China, Japan and Italy, and is known by different trade names. The principal varieties used are steam waste (imported from Canton), best Piedmont gum waste, Italian, knubs, China curlies (imported from Shanghai), semi-extra China curlies, and yellow Chassum Kashmir waste. In former years Bengal waste was also used in large quantities, but at present its consumption is very small, owing partly to the shortage of supplies, and partly to its unsuitability for the English market. Other Indian wastes have also been used from time to time, but on the whole there has been a very limited exportation of this useful by-product from India for the last few years. This decline is an obvious outcome of the decline in the production of raw silk, and therefore it cannot be stopped unless immediate steps are taken to resuscitate the silk-producing industry.

Let us now resume the investigation of the choice of the raw material best suited for the spinning industry. It is interesting to find that the general principles involved in the choice of the waste silk are the same as in the case of raw silk. Judged from the negative aspect of the subject, the defects generally found in the supplies imported from India and the

Eastern countries can be divided into two classes, those that affect the quality of the finished spun yarn, and those which influence the cost of production. But unlike raw silk, these two aspects are associated with each other in such a way that it is difficult to separate them, because those defects which increase the cost of production are bound to affect the quality of the finished yarn and *vice versa*. We shall therefore consider them conjointly.

Before entering into an examination of the defects found in the waste silk, I think it would not be out of place to give an outline of the processes through which the initial waste silk fibre passes. This outline would enable us to understand the quality of the staple required for spinning and thus we should be in a better position to realise the economic importance of a proper choice of the raw material. Moreover, it will show how each process determines the necessity of choosing good waste to start with in order to obtain good results at the end when the yarn is ready for the market.

The preliminary process of opening the bales and sorting them according to their colour and grade, or of mixing them up to suit further requirements, does not require any explanation, except in those cases where the bales are press-packed and need careful treatment while breaking up the layers of silk. It is only in the last case where trouble arises, and sometimes power hammers are resorted to. But generally the process is accomplished without much inconvenience.

The first important process is what in England is known as "boiling off" or "discharging" and on the Continent is known by the name of "schapping." This is carried out in order to free the natural gum or sericin from the silk and to prepare it for cleaning and drafting. This process involves a good deal of labour and care, as the intrinsic value of the fibre for after processes in spinning depends upon the excellence of this process which, if poorly carried out, spoils the whole series of operations. Great care is taken to use good soft water and a fine quality of soap. The silk is subjected to boiling liquors of water and soap so as to get rid of the gum as quickly as possible. There are two stages in the process: the first is thoroughly softening the gum and making the silk

feel soft and "slimy"; the second is washing off the gum and at the same time bleaching the fibre. The process is very delicate, and great care is taken to keep the original properties of the silk fibre intact. Disintegration of the fibre is rigorously avoided. Extremes of any kind would either affect the strength of the fibre or render it absolutely useless. In case of under-boiling, the waste requires a subsequent treatment which is always detrimental to the quality of the thread.

After the completion of the first process which includes bleaching and drying, the boiled-off silk is carefully examined to remove all foreign matter that may be contained in it. Some kinds of waste contain considerable quantities of straw, China grass, hemp, hairs (of animals and human beings), hard twisted silk threads, bits of paper, etc. This process is called "picking," and strictly speaking is a waste of labour and capital. We shall deal with this point later in the present chapter.

A process which is sometimes used in the spinning industry to destroy vegetable matter and other extraneous mixtures of a similar nature is known as "carbonisation." Dilute sulphuric acid is used to carry out this process, and great care is taken to preserve the delicate nature of the fibre which if damaged by an acid is extremely difficult to remedy by any other treatment. In order to avoid the use of acids the waste silk should be as pure and free from vegetable matter as possible. If subjected to these processes the original fibres undergo considerable punishment, and thus yield defective yarns.

The next step is known as "conditioning." The "boiled-off" silk is allowed to absorb its natural moisture of 11 per cent. If the silk is dry and harsh it will not work properly, and if, on the other hand, it is moistened with water it becomes wet in patches and is rendered unworkable for after processes. To avoid irregularity in condition the silk should be well and evenly dried. At the same time it is detrimental to the quality of the fibre to force it into condition; it must have time to pick up moisture naturally. The best method of allowing it to do so is to construct a conditioning floor and

let it lie on it for a sufficient time to pick up moisture (generally for six weeks, but experience is the only guide in determining the proper time for the duration of this process). This is the natural method of conditioning, and is carried out to let the silk recover its softness, natural strength, and elasticity.

When the silk is ready for "dressing" it is opened up so as to give it a very loose appearance and to take out the lumps of tangled fibre which need to be brought into a more parallel position. To do this the silk is passed through various combing machines two or three times according to the requirements. When it is properly combed it is completely ready for dressing and preparing the staple obtained for purposes of spinning into yarn. The intermediate processes produce drafts which are technically known as "Sliver" and "Rover." The object of these processes is to still further straighten the fibres of silk, and to properly draw it out, because if the fibre is short, the silk is inclined to be loose and fluffy. Before the drafts are ready for the spinning machinery they must be perfectly long and compact, so that they can stand the tension in twisting. First of all the yarn is spun into singles and then doubled or put into threefolds as required. There are other subsequent processes of cleaning and "gassing" to give the spun yarn a finishing touch before it is sent to the manufacturer. These processes are all of a very technical nature and do not concern us here.

It would be very interesting at this stage of the investigation to point out the fundamental difference between the English system of "boiling off" and the continental system of "schapping" the waste silk. As we pointed out in a previous chapter, the essential difference lies in the first stage of the industry. In England the natural gum contained in the waste silk is completely removed as quickly as possible by boiling the raw material in liquors of soap and water, while in France, Switzerland and Italy, the process of fermentation is used, and a small percentage of the natural gum is left in the fibre. The practical principle involved in "schapping" is the slow decomposition of the gum contained in the waste silk. This is done to maintain the richness of the silk and to keep the fibre as soft as possible. The waste

is piled in a heap in a damp warm place and allowed to ferment and loosen itself in the presence of moisture. The pile is constantly disturbed so as to obtain a uniform softening in each and every portion of the waste. This process takes a long time to achieve proper results, and, therefore, nowadays, a quicker method is resorted to. Instead of natural fermentation, water which is kept at a certain definite temperature by means of steam pipes, is circulated freely over the waste to soften it properly. In order to get a thorough saturation the silk is well beaten down and left in boiling water for two or three days according to the nature of the waste used. After the expiry of this period the silk is properly rubbed between the fingers and mingled fibres are loosened. A simple test is to break the silk ; if it shows fine fibres at the broken ends it is taken out for subsequent washing, otherwise it is left in the wooden tanks a day or two longer to get proper softness. When the proper softness is fully obtained, the waste is transferred to different tanks and thoroughly washed in hot water and soap. Loose gum and dirty liquor are extracted by placing the silk in a hydro-extractor. It is then subjected to another washing in hot water and beaters are used to loosen the remaining gum and to make the waste pliable. In some cases running water is used to get extra cleanliness. The object of the whole process is to degum the waste gradually and slowly so as to keep the fibre strong.

Unlike the English system of complete and rapid degumming, the continental method of "schapping" requires a partial preservation of the natural gum. The price of the finished spun yarn is inversely proportional to the amount of gum left in the fibre, as the greater the amount of gum retained in the silk, the lower is the net cost of production. A very good class of yarn contains about 3 to 5 per cent. of gum. This more or less exact determination of the percentage of gum left in the fibre is gained by constant experience in schapping, and is a matter of great importance to the buyer of schappes¹ who pays for his supplies according to the quality

¹ It might be noted here that the yarns obtained from all kinds of waste silks by the process of "schapping" are known as schappes.

of the yarn as determined, to a certain extent, by the amount of gum retained in the discharged silk.

Above we have given a brief description of the British and continental methods of preparing the waste silk for spinning, and have pointed out the essential difference between the preliminary processes. It might, perhaps, be regarded as redundant to enter into the technical details of the silk-spinning industry in an economic treatise, but further discussion would show that each preliminary process has a direct bearing on the fundamental aspects of production, and is intimately associated with the economies resulting from a proper choice of the raw material. It is therefore evident that a knowledge of the spinning processes would help us in realising the economic importance of the raw material best suited for the silk-spinning industry.

We have observed previously that the bulk of the raw material used in the British silk-spinning industry is imported from China, Japan and Italy ; though in former years Bengal waste silks were also used. The spinners are, as a rule, satisfied with the supplies of waste silk imported from Italy and Japan, as these importations give satisfactory results in the preliminary processes of spinning. As regards Indian wastes, the experience of almost all the spinners has been very discouraging ; and it is therefore in these wastes that we shall find an illustration of those defects which not only raise the cost of production of the spun yarns, but also deteriorate their quality.

The principal defect which reflects upon the economic production of spun yarns is the presence in the waste silk of foreign matter such as vegetable fibres, cotton twisted into knots, hairs, bits of paper, and especially clay. In some grades of waste, balls of silk, hemp fibres and sometimes mineral substances are found in abundance (from 10 to 15 per cent. or more) and therefore they are rejected by spinners. These impurities hinder not only the rate of progress of the first process, but also cause unnecessary delay in the after processes. Notwithstanding repeated boiling in soap liquor, the clay contained in the waste silk is not eliminated, and when the discharged silk is dried, it appears

in small particles of dust on the fibres and in addition to being objectionable to the workers, it causes the draft to be so sticky as to prevent proper drafting. The most undesirable feature from the English spinner's point of view is not that the waste contains so much of the manufacturing extraneous matter, but that it contains so much that is absolutely foreign to silk in any process, either of growth, manufacture or packing.

It is well known that the tensile strength of spun silk depends, other conditions being satisfactory, on the length, strength, and fineness of the staple, and that from the spinner's point of view the value of the waste silk depends on these three qualities. The unfortunate situation created by the above-mentioned defects is that even if the staple possessed the requisite spinning qualities, the presence of the extraneous matter would hinder its consumption in the manufacture of higher grades of yarns.

A defective raw material is uneconomical for two reasons, firstly, because it impairs the quality of the yarn, and secondly, because it unnecessarily increases the cost of spinning. The yarn spun from defective waste silk can be used only for an inferior class of goods in which imperfections do not matter. The hairs in the waste, if not extracted during the process, appear in the fabrics manufactured from the yarn made out of that waste, and in this way render the manufactured commodity unmarketable under a specified grade. Thus the incidence of the defects in the raw material falls on both the spinners and the manufacturer.

With regard to the complete elimination of the extraneous matter, it might be observed that some of it is extremely difficult to remove even after continued processes. But this does not apply to each and every kind of foreign matter. The presence of cotton threads, for instance, can be easily detected by using a blue dye which readily affects them without reacting on the silk fibres. All the cotton threads are coloured blue by this dye and the silk remains uncoloured, the result being that cotton can be picked out. This is, however, a process which involves an unnecessary increase in the cost of production. There is no automatic mechanical

process by which this could be done, and the only alternative is to resort to the process of "picking" which is by no means a pleasant occupation for the female workers. After the waste silk is degummed and dried it is handed over to women to extricate *all* that is not silk. If the waste is bought at 4s. a pound and 6d. per pound is paid for discharging the gum, the extra amount of labour required for cleaning it enhances the price by another 3d. per pound; in other words, there is an increase of 5.5 per cent. in the cost of preparing the raw material for the drafting and spinning processes owing to the presence of impurities in the waste silk. But in some cases, even after the employment of additional labour, small impurities of a peculiar nature still remain in the raw material and greatly deteriorate the quality of the yarn.

We have observed in a previous paragraph that the process of "carbonisation" has been found very effective in most cases for the removal of vegetable impurities from the waste silk. It is largely used in worsted spinning for removing vegetable matters from wool, but silk being very delicate stands the chance of being damaged by the application of acids. The difficulty arises from the fact that in England the waste is wholly discharged, and therefore, on account of the absence of gum, there is no preservative in the fibre to protect it against the action of acids. Another point is that the acid used in this process finally reduces the vegetable matter to powder, the presence of which makes it difficult for the spinner to clean the silk thoroughly. This method is, however, used to a much greater extent on the Continent where the gum is not wholly discharged from the silk and the fibre remains unattacked by the acid; that is, the gum acts as a preservative. There is no doubt that further scientific improvements on the process will perfect the system to such an extent as to enable the British spinner to use it safely and with confidence.

But it will be noticed that the addition of these processes implies not only the addition of extra items to the cost of production of the spun yarn, but also, other factors remaining equal, a consequent reduction in the profits of production. The present industrial conditions and those which are likely

to prevail in the near future demand, firstly, an economy in the labour charges and, secondly, an increase in the total output of yarn. Both of these conditions are of a purely economic nature and perform distinct functions. The first condition causes a reduction in the cost of production and thus enables the product of the industry to meet the price competition in the world's market, and the second maintains a constant supply of spun yarns for the weaving industry. The fulfilment of these conditions depends, when other factors in production are satisfactory, on the perfection of the quality of the raw material, as a good raw material not only reduces the labour charges, but also increases the output of the yarn.

Weight of Raw Waste.	Name.	Yield after "Boiling off."		Yield of Dressed Silk.	
		Lbs.	Ozs.	Lbs.	Ozs.
10 lbs.	Best Piedmont gum waste .	7	12	6	0½
"	No. 1 China Curlies .	7	9	4	11
"	Semi-extra China Curlies .	7	4	4	15¾
"	Yellow Chassum Kashmir waste	7	4	5	15
"	Extra selected Opened Steam waste	6	9	4	15¾
"	Punjum Books No. 3's. .	6	1	4	2¾

A very important point in connection with the problem of "output" is the "final yield" from waste silk. As a matter of fact, the prosperity and the profits of the spinner depend largely on the yield from the raw material used in spinning. If he pays high prices for the raw material and receives low yield in the end, evidently he is working under unprofitable conditions. If, on the other hand, he gets a high yield from an ordinary waste, his output increases and his profits rise proportionately. It is therefore more economical from the spinner's point of view to buy wastes which in the long run give a larger output of good yarn than to consume

wastes which yield a comparatively small quantity of spun yarn.

For purposes of an accurate comparison, we shall consider (a) the yield of silk after "boiling off" and (b) the yield of dressed silk. It will be inaccurate to compare the yield from waste silks in the shape of spun yarns, as a good deal depends on the counts of the thread which cause variations in the quantities obtained from different wastes, and do not present an accurate estimate. The table on p. 267 gives the results of a few tests of samples of various qualities of waste silks, showing the yield in two different stages.

From the results of these tests it was found that Yellow Kashmir waste (which has been widely used in England) gave a fairly good yield of dressed silk. It comes next to Best Piedmont gum waste which is supposed to be one of the best in this respect. Comparatively speaking, it is very clean and does not require much "picking." It is therefore more economical from the point of view of cost of production than some of the Chinese wastes.

We have now completed our study of the quality of the raw material required for the silk-spinning industry, and have indicated its relation to the economies associated with the cost of production, the output, and the quality of the finished yarn. At this point a few words about the utility and consumption of spun yarns cannot fail to be interesting.

The silk-spinning industry supplies yarns for general manufacturing purposes, such as sewing silks, weaving yarns for dress goods, yarns for the hosiery trade, and more frequently, yarns for the manufacture of velours and plushes. During the last forty years, the consumption of fabrics made from spun silk has been steadily increasing. On the one hand, this increased consumption has stimulated the production of spun yarns in France, Germany, Switzerland, Italy and England, and on the other, it has caused the creation of important markets for the initial raw material at Marseilles, Milan, Yokohama and Canton.

The principal causes which have led to the increased utilisation of the spun silks are to be found firstly in the properties of the fibre, and secondly, in the comparison of

its prices with those of the real silk. The brilliant and attractive appearance of the spun silk thread admits of its being used in conjunction with the real silk, and thus widens the scope of its utility. Moreover, the various combinations of the two fibres not only satisfy the popular demand, but also cause substantial reduction in the prices of the silk fabrics, and thus increase the consumption of both. It is safe to predict that in the near future the spun silk thread will find still larger channels of consumption and it will be used more and more in the manufacture of articles of common use.

From an economic point of view it is evident that the utilisation of the precious by-product of the silk industry has added to the amount of international wealth by converting an otherwise unworkable commodity into a useful textile material and also by employing labour and capital in a profitable industry. From the point of view of the producer of raw silk the economic return from the exportation of the waste forms an additional contribution to the profits of production. As the waste silk forms a raw material for the spinning industry and the spun silk for the manufacturing industry, it is important that the initial raw material should be completely free from those defects which affect the quality of the final product. An improvement of this nature in the quality of the waste silk would benefit, firstly, the producer, secondly, the spinner, and thirdly, the manufacturer of silk goods, and would thereby add to the economic welfare of the silk industry as a whole.

In the present chapter, as in the last, we have considered the quality of the raw material in the light of the fundamental economies of production. We have shown how the cost of production and the output of spun yarns are related to the proper choice of the waste silk and how the absence of extraneous matter in the waste causes a reduction in the labour charges. The presence of impurities in the raw material introduces extra and unnecessary processes into the silk-spinning industry and thus raises the cost of production of the finished yarn. We have seen that the general principles governing the choice of the raw material are the same

in spinning as in manufacturing. We have also observed that the British silk industry produces only "specialities" and high class of goods, and is therefore very susceptible to the variations in the quality of the raw material. The maintenance of the high standard of quality in the raw silk or in the waste silk is a matter which concerns the producer, for whose guidance we have given the necessary suggestions in the present chapter.

The problems associated with the raw material do not directly touch upon the subject of foreign competition, and are connected chiefly with the internal organisation of the industry. It is, however, necessary to turn our attention to the influences of foreign competition on the position of the British silk industry in order to discover the causes which explain the relative position of the foreign competing industries. We shall now proceed to study the effects and the operation of those factors which determine the nature and the limits of foreign competition.

CHAPTER XVIII

FOREIGN COMPETITION

ITS EFFECT ON THE BRITISH SILK INDUSTRY.

No other branch of the British textile industries has suffered as much from the depressing influences of foreign competition as the silk industry. The continued attacks of foreign goods, during a period extending over half a century, in both the home and colonial markets, have affected almost every economic aspect of the industry. Nearly every branch of the industry has suffered in consequence of the increased importations of the silk goods which were formerly manufactured in this country. We have already dwelt upon the extent of the decline in the individual branches of the industry and need not comment on it here, but it is necessary to observe once again that among the principal causes which led to the downfall of the British silk industry, the evil influence of foreign competition is the most predominant. The only branch which has remarkably survived the pressure of foreign attacks is the silk-spinning industry, whose products have all along been in a position to compete with the continental productions. The other branches, such as the throwing industry, the manufacture of braids and trimmings, and the manufacture of taffetas and satins have all gradually lost their former importance. In short, it is difficult to point out even a single branch of the silk-manufacturing industry which has escaped the deplorable effects of foreign competition.

The era of foreign competition began its actual operations after the ratification of the Cobden Treaty with France in 1860, and the removal of the 15 per cent. duty on French and other continental silks. Since that time the British silk industry has declined with varying degrees of fluctuations.

From the manufacturers' point of view the most profitable period was during and immediately after, the Franco-Prussian war, when large profits were made in two or three years owing to the temporary cessation of silk manufacturing in France, and to consequent high prices. But after the year 1880, the general experience of silk throwsters and manufacturers has been one of greatly diminished net profits.¹ From an economic and industrial point of view the industry cannot be said to have seen prosperous days after the year 1875. The additional stimulus imparted to the industry by the continental markets during 1870-72 lasted only for two or three years, after which the production of silk goods began to decline. The rate of decline was very rapid at the end of the last century. During the last fifteen years the important branches of the British silk industry have maintained their position to a certain extent, though it would be inaccurate to say that they have enjoyed prosperity.

The disastrous effects of foreign competition have exercised their influence on all the three important aspects of the industry, the economic, the industrial and the commercial, and in order to obtain a bird's-eye view of the situation, it would be advisable to consider them conjointly. We shall classify the operations of foreign competition in two main groups, the first relating to the decline in the economic and industrial conditions, and the second bearing on the commercial decline. Each of these two groups is characterised by three distinct features which represent the principal functions of the industry.

Let us first examine the features of the first group which relates to the decline in the economic and industrial conditions. These may be divided into three classes ; (a) decline in the labour force ; (b) decline in the number of silk mills ; and (c) decline in the consumption of the raw material. We have already observed that one of the first effects of foreign competition on the British silk industry was the reduction in the number of workers employed in the industry. As the employment of labour depends on the amount of production,

¹ See Report of the Tariff Commission, 1905, Vol. II., Part VI., par. 3136.

it was obviously necessary to reduce the number of hands when foreign competition began to show its effects on the production of silk goods in Great Britain. After the year 1860, when the British markets were taken up by the French manufacturers and silk goods were sold at prices far lower than those at which the British manufacturers could sell, the British silk workers began to suffer from want of employment. Most of the workers gradually abandoned this occupation and turned their attention to the other branches of the textile industries. In this way the silk industry lost the greater part of its labour force before the beginning of the present century. The following table shows the decline in the number of persons engaged in the various branches of the silk industry in England and Wales since 1851—the first year in which the census contained a return of occupations.¹

NUMBER OF PERSONS IN ENGLAND AND WALES OCCUPIED
IN THE SILK INDUSTRY.

	1851.	1861.	1871.	1881.	1891.	1901.	1907. ²
Males . . .	53,936	43,732	29,225	22,205	19,090	13,859	8,495
Females . . .	76,787	72,588	53,738	42,630	32,937	25,176	20,783
Total . . .	130,723	116,320	82,963	64,835	52,027	39,035	29,278

The above table does not include the number of persons engaged in the Scottish and Irish silk industries, and therefore does not explain the position in so far as the whole of the United Kingdom is concerned. The figures representing the exact variations in the number of persons employed in the Scottish industry are not available, but it appears from the statement made by one of the witnesses before the Tariff Commission in 1904 that, from 1877 to 1892, its history was one of continual progress,³ so much so that the manufacturers

¹ This table has been quoted from the Report of the Tariff Commission, Vol. II., Part VI., par. 3165.

² The detailed figures for the whole of the United Kingdom are given in "Census of Production, 1907," Part III., p. 359.

³ The decline of the Scottish industry began later than that of the English industry, owing mainly to the fact that it did not feel the

had to build additional works in the suburbs of Glasgow. The period of decline began in 1893, when the Italian thrown silks entered the British market. Since then the Scottish silk industry has just maintained its existence. According to the returns of the "Census of Production, 1907," the number of wage-earners employed in the silk industry was 935 in Scotland, and 497 in Ireland. Adding the figures for Scotland and Ireland to those for England and Wales, we find that the total labour force of the British silk industry in 1907 was 30,710, of which 8,805 were males, and 21,905 were females. It might be observed here that the total labour strength of the industry has remained more or less constant since 1907.¹

Analysing the figures given in the table, we see that the number of persons employed in the silk industry in England and Wales has steadily fallen since 1851. In a period of fifty years, from 1851 to 1901, the industry lost about 70 per cent. of its labour force. But the most striking feature of this decline was that, while in 1851 the ratio of male workers to female workers was about 2·1 to 3, in 1901, it was nearly 1 to 2; so that the reduction in the number of the former was much greater than in the number of the latter. The decline in the ratio of males to females was still more conspicuous in 1907, when out of a total number of 29,278 wage-earners employed in the silk industry in England and Wales, only 8,495 were males and 20,783 were females. Here again we find that one of the outstanding effects of foreign competition has been to increase the employment of women and children, and to lessen that of skilled men operatives. Even at the present time the tendency of the workers is, as a rule, to seek for employment in another industry which is more remunerative than the silk industry. During the war the opportunities afforded by the munition factories acted as an additional stimulus to this tendency, and workers in several branches of the industry either actually transferred their

pressure of Italian competition in the thrown silk market till the year 1892.

¹ There was a very slight reduction in some branches of the industry in 1915 owing to the war, but it did not affect the general situation.

services or at least attempted to do so. But as the nature of work in some of the munition industries was very arduous and also as some of the silk mills were engaged on war work, the actual transference of labour was practically negligible.

As regards the second point in the present discussion, that is, the decline in the number of silk mills, it is extremely difficult to give accurate figures, owing chiefly to the fact that it is impossible to draw a clear line of demarcation between factories turning out pure silk goods and factories turning out mixed goods. In the majority of cases, the manufacturer produces two principal classes of goods; (a) those which contain nothing but silk, and (b) those in which silk is used in conjunction with either cotton or wool. It is therefore difficult to say whether the survival of a particular mill is due mainly to its mixed productions or to its pure silk productions. Another point worth noting is that in some cases the mills have survived the effects of foreign competition owing to the extensive use of the artificial silk fibre, and these mills have also been recorded as silk mills in the past official factory returns. Strictly speaking, these mills have existed because of the displacement of the real silk by the artificial silk, or in some cases, because of the predominance of the mixed goods over pure silk goods. Obviously it would be inaccurate to draw our conclusions from the figures given in the factory returns which include all classes of silk mills, and do not show how far production in certain mills is limited to other than silk goods.

It is, however, possible to judge the decline in the number of silk mills from the statements made by various expert witnesses who have appeared before different committees of inquiry held at different times. One of the most important of these committees was the Tariff Commission whose final report was published in 1905. This report clearly shows that one of the disastrous effects of foreign competition on the British silk industry was the complete disappearance of a large number of silk mills. "My own firm," says a Macclesfield witness, "had four throwing mills at work twenty years ago, employing 1,200 hands. To-day, we have closed

our mills and broken up the machinery and we do not employ one.”¹ It was stated that, while in the early “seventies,” there were twenty-two throwing mills within twenty miles of Nottingham, in 1904 or 1905 they had been reduced to three.¹ In a similar manner the weaving industry suffered as much as throwing, and in those places where, fifty years ago, there were 5,000 looms going, there are only 1,500 working now. We have already stated in a previous chapter that those districts in which the manufacture of ribbons and narrow-web goods once flourished do not retain even one-tenth of their former prosperity. Most of the manufacturers were compelled to close their mills owing to the increased consumption of foreign goods in the home markets. It is needless to dwell here upon the decline in the individual branches of the industry, but it is necessary to mention that foreign competition reacted rather seriously on the spirit of enterprise in the British silk industry, and in doing so caused a considerable reduction in the number of manufacturing houses.

The decline in the labour force and in the number of silk mills brings us in logical sequence to a consideration of the decline in the consumption of the raw material. As there are no reliable figures available of the annual consumption of raw and thrown silk used in the British silk industry, we shall draw our conclusions from the figures given in the annual trade returns. The most practical way of dealing with the question would be to consider the imports and re-exports, in order to arrive at an estimate of the quantities retained for home consumption. But it may be pointed out that some of the earlier statistical records are not wholly trustworthy, owing partly to the lack of a definite classification of the various kinds of silks and partly to the probable inclusion of some of those items in the re-exports which are excluded from the imports. However, for purposes of comparison, the following table showing the quantities of the waste, raw and thrown silks imported into and re-exported from the United Kingdom since 1857, may be regarded as representing

¹ These extracts have been quoted from the Report of the Tariff Commission.

approximate averages of the quantities retained for consumption during the periods indicated.¹

Average for	Waste Silk.			Raw Silk.			Thrown Silk.			Raw and Thrown Silk (total).
	Im-ports.	Re-ex-ports.	Re-tained.	Im-ports.	Re-ex-ports.	Re-tained.	Im-ports.	Re-ex-ports.	Re-tained.	
	Thous. cwts.	Thous. cwts.	Thous. cwts.	Million lbs.	Million lbs.	Million lbs.	Thous. lbs.	Thous. lbs.	Thous. lbs.	
1857-64	24	—	24	8.93	3.30	5.63	234	257	23 ²	5.65
1865-74	31	—	31	6.73	2.96	3.77	166	65	99	3.87
1875-79	32	5	27	4.60	2.10	2.51	103	44	65	2.58
1880-84	56	7	49	3.53	.73	2.80	249	15	234	3.03
1885-89	70	8	62	2.60	.32	2.28	421	72	369	2.65
1890-94	62	7	55	1.90	.15	1.77	483	51	431	2.20
1895-99	64	5	59	1.90	.12	1.78	449	43	406	2.19
1900-04	61	7	54	1.29	.19	1.10	705	61	644	1.74
1905-09	69	6	63	1.11	.09	1.02	876	51	825	1.85
1910-14	63	7	56	1.09	.12	.97	1,005	49	956	1.93

The figures given in the above table lead to some very interesting conclusions. Let us first examine the consumption of raw silk which shows a more or less continuous decline throughout the period under review. There are two points which attract our attention most. The first is, the decline in the average imports of raw silk into the British market from 8.93 million pounds during the period 1857-64 to 6.73 during the period 1865-74, and finally to 1.29 during the period 1900-04. This marked decline in the amounts of imports at three different periods shows that probably there was a corresponding decline in the annual British consumption of raw silk. The second point worth noting is the marked decline in the amount of re-exports after the year 1880, which indicates that England no longer remained an important distributing market for raw silk.² This conclusion is further substantiated by the ultimate decline in the amount of re-exports which reached the insignificant figure of .09 during the period 1905-09. The decline in the imports

¹ The above table is a modified and enlarged form of a similar table given in the Report of the Royal Tariff Commission.

² The excess of re-exports over imports is probably due to a statistical error.

³ We shall deal with this point in a later chapter.

and re-exports brings us to the fall in the quantities retained for home consumption. As we have already stated, the first effects of foreign competition were felt after the ratification of the Cobden Treaty with France in 1860, and that is why the average consumption for the period 1857-64 remained at a comparatively high level. But during the period 1865-74 there was a fall of 1·86 million pounds in the average annual consumption; this period includes the temporary increase in the consumption of the raw material due to the Franco-Prussian war. Again, comparing the period 1875-79 with the period 1900-04, we find that by the beginning of the present century the quantities retained for consumption had fallen by 56 per cent. Finally, the comparisons of the periods 1857-64 and 1865-74 with the period 1910-14 show that the quantity of raw silk retained for consumption has fallen by 83 per cent. from the first, and by 73 per cent. from the second period.

On the other hand, the imports of thrown silk have risen gradually from an average of 249,000 lbs. during 1880-84 to an average of 1,005,000 lbs. during 1910-14. Allowing for the small quantities re-exported, we find that the British consumption of imported thrown silk has risen from an average of 234,000 lbs. during 1880-84 to an average of 956,000 lbs. during the last period under review, or in other words, the consumption of foreign thrown silk has more than quadrupled within a period of thirty-five years. This is a clear indication of the fatal effects of foreign competition on the British throwing industry which has been gradually reduced to an insignificant size. If we consider the consumption of raw and thrown silk as a whole, even then we find that the history of the British silk industry presents a gloomy picture in so far as the consumption of the raw material is concerned. The total consumption of raw and thrown silks has fallen from an average of 5·65 million pounds during 1857-64 to an average of a little below two million pounds during 1910-14, thus showing a net decline of about 66 per cent.

While the consumption of raw and thrown silks has greatly declined, that of the waste silk has followed an upward move-

ment ever since 1880, so that the abandonment of throwing has been followed by a very much increased activity in spinning. The comparison of the average quantity of waste silk retained for consumption during the period 1875-79 with that retained during the period 1900-04 is very significant. Within a period of twenty-five years the consumption of this important raw material increased by fully 100 per cent. The average annual consumption during the period 1905-09 amounted to 63,000 cwts., the highest during the whole history of the British silk-spinning industry. The subsequent fall of 7,000 cwts. during the next period, that is, 1910-14, is due to the inclusion of the first five months of the war, during which there was a considerable decline in the imports of waste silk. The average annual consumption of waste silk would have steadily continued its upward movement but for the extraordinary industrial conditions arising out of the war. There is, however, sufficient evidence available which points to the fact that even during the war the silk-spinning industry fared far better than the other branches of the silk industry, owing mainly to its useful contributions to war materials. The manufacture of cartridge bags, balloons, parachutes and sewings for military and naval uniforms necessitated the maintenance of the full producing capacity of the silk-spinning industry, and thus maintained the consumption of the raw material as far as the limited importations permitted under the restricted transport conditions.

The increased consumption of the waste silk clearly indicates that the blows of foreign competition have been sustained bravely by the British spinning industry. As is known to every one familiar with the history of the silk-spinning industry, the success of the British silk spun yarns in the American market has been due entirely to the fineness of the counts and the high quality of the thread. The industry has been developed along the lines of specialisation and the greatest attention has been paid to the quality of the product. For this reason the importation of foreign spun yarns has been restricted more or less to those grades which are not produced by the home industry and are used only for the manufacture of mixed goods. The other factors in

production which have played an important part in defeating foreign competition will be touched upon in the next chapter.

Among the second group of effects of foreign competition on the position of the British silk industry, the most important is the increased importation of silk goods into the United Kingdom. This group deals more with the commercial aspects of the problem of foreign competition than with the purely economic. In former years, the demand for manufactured goods in the home market was supplied chiefly by the home manufacturers, and the importation of foreign goods took place only under special circumstances. This was due partly to the tariff barrier, which before the year 1860 affected the importation of foreign silk goods into the United Kingdom, and partly to the existence of a home silk industry which was sufficiently equipped with labour and capital to meet the current demand for silk fabrics in the home market. But, after the commencement of the era of foreign competition, the home manufactures received a death-blow, and the effects of the free entry of foreign goods were so fatal that within a year or two after the ratification of the Cobden Treaty, the importations from the Continent more than doubled in value. While in 1854 and in 1860, the value of silk manufactures imported into the United Kingdom amounted to about 2·3 and 3·4 million pounds respectively, in 1861, it had gone beyond 6·7 million pounds. From 1875 to 1890, the value of the imports moved between ten and thirteen million pounds, but in 1897 it reached a very high level, about seventeen million pounds. It might be observed, however, that the year 1897 has so far marked the highest point in the values of British importations of silk manufactures. Since the beginning of the present century, the quinquennial averages have been 13·97 million pounds during the period 1900-04, 12·60 during 1905-09, and 13·33 during 1910-14; with a minimum of 11·90 in 1908, and a maximum of 14·77 in 1900.

We may logically conclude from the evidence presented by the trade returns that the sudden rise in the imports of silk manufactures after the year 1860 was due to the free entry of foreign goods into the British market. It was impossible for

the home manufactures to compete in prices with the continental productions owing to a material difference in the cost of production. Before 1860 this difference was counter-balanced, more or less, by a 15 per cent. import duty which afforded the British manufacturer an equal chance of competition in the home market, but after that period he had either to give up business altogether or to reduce his profits to a minimum margin. The former course was adopted more frequently than the latter, and for this reason, the amount of home production of silk goods began to follow a downward movement. The importation of continental goods increased with the decline of the home silk industry and gradually, only a very minor part of the home trade remained in the hands of the British manufacturers. It is estimated that at present only 20 per cent. of the silk goods consumed annually in the United Kingdom are of home manufacture.¹

It would be interesting to observe here that the increased imports of silk manufactures from the Continent into the United Kingdom during the late "nineties," were, to a certain extent, the result of the high American tariff barrier which checked the easy inflow of certain classes of continental silk goods into the American market. The continental manufacturers having lost some of their American customers, turned their attention to the British markets, and in order to obtain a favourable footing, in some cases, they sold their goods even below the cost price. Thus the partial loss incurred by them in their American trade was compensated by an additional gain in the British trade.

The next point which calls for a consideration is the increase in the number of silk merchants and traders. This, as might be expected, was a direct consequence of the decline in the amount of home production and the increase in the amount of imports. In the first place, there was an increase in the number of yarn merchants who found it more profitable to import thrown silk from the Continent than to keep the home industry going. As a matter of fact, some of the British throwsters transferred their activities from throwing to importing thrown silk in order to remain in the business.

¹ See Report on the Textile Trades after the War, 1918, p. 77.

In the second place, there was an increase in the number of "makers-up" of silk goods. This was also due to the pressure of foreign competition. Those manufacturers who formerly produced piece goods on a small scale could no longer compete successfully with the importers of silk manufactures, and in order to avert heavy losses adopted the system of "making up" goods for the home market. Although the trade in made-up goods is subject to seasonal variations owing to the changes in fashions, it affords more or less regular employment to women and young girls. It involves the consumption of piece goods whether imported or home made and from a commercial point of view presents greater facilities than the purely manufacturing trade. The demand for articles of common use is variable and immediate, and depends, to a large extent, on national characteristics. This particular feature of the demand for made-up goods lessens the chances of foreign competition, and tends to cause an increase in the home production. It is therefore easy to understand how a part of the purely manufacturing industry was converted into a subsidiary industry which utilises manufactured or semi-manufactured goods and satisfies the popular demand.

The last point worthy of notice in the second group of influences of foreign competition is that, while the imports of silk manufactures have greatly increased since the early "sixties," the exports have, on the whole, maintained a position of equilibrium. Judged from the evidence of the official trade returns, the value of the latter has, as a rule, moved between one and two million pounds. The decade 1880-90 is the only period during which it crossed the upper limit and reached as high a figure as 2·7 million pounds in 1882. The reason for this unusual increase in the exports of silk manufactures from the United Kingdom during the "eighties" was that the older methods of manufacturing velvets, plushes, and other pile fabrics were being rapidly displaced by new inventions during those years. These inventions not only made manufacturing more economical than before, but also greatly increased the output, and thus enabled the manufacturers to export large quantities of pile

goods to the United States. Later, in the early "nineties," the exports were again checked by the new American tariffs and were ultimately brought back to their usual level.

With regard to the export trade it might be noted that although the value of the British exports of silk manufactures has moved within a very limited range, the yardage of broad piece goods has made great strides during the last forty years. Let us, for instance, consider the exports in two typical years. In 1880 the value of 6.21 million yards of broad piece goods exported from the United Kingdom was nearly one million pounds, while in 1900, the value of 10.24 million yards amounted to 964,000 pounds only. Similar instances, which are found abundantly in other years also can be explained by considering the quality and the nature of the goods exported. In some years the exports consist more of "mixed goods"¹ than of "all silk" goods and the value is therefore lower than when the latter predominate. Another thing that often happens is that the total yardage increases more in proportion to the value, owing to the presence of large quantities of "mixed goods" in the exports, and therefore an increase of this kind does not imply an increase in the exportation of pure silk manufactures.²

So far we have considered the outstanding effects of foreign competition on the British silk industry and trade without entering into an examination of the actual causes which rendered such effects possible. There must be some economic forces behind the apparent operation of foreign competition which offer favourable opportunities to the successful competitors. These forces, in so far as they are of an economic nature, must determine the difference in the comparative advantages for production in the competing countries. But the main question at issue is, how does the difference in the comparative advantages affect the cost of production of silk goods and ultimately renders the market conditions favourable for one country and unfavourable for another? The problem

¹ Silk goods containing cotton or wool are termed "mixed goods."

² The lower values of the silk goods exported during the late "nineties" may also be explained in part by referring to the general fall in prices.

when stated briefly is this : why are the continental countries able to produce certain classes of silk goods cheaper than England ? The answer to this question is explained by the principle of comparative cost, which is in almost all cases the pivot of foreign competition. We shall now proceed to examine the predominant aspects of this important economic principle in the light of the present inquiry.

CHAPTER XIX

FACTORS IN FOREIGN COMPETITION

THE principle of comparative cost or comparative advantage, as Professor Taussig calls it, plays a very important part in international trade, but owing to the complicated controversies underlying its details, it is generally understood as a theoretical doctrine in the business world. "Briefly stated," says Professor Taussig, "the doctrine is that a country tends under conditions of freedom to devote its labour and capital to those industries in which they work to greatest effect. It will be found unprofitable to turn to industries in which, though labour and capital may be employed with effect, they are applied with less effect than in the more advantageous industries."¹ The business man, however, simply wants to know why a particular competing country is able to produce a certain commodity cheaper than his own country, and how does the difference in the final competing price arise. In most cases he does not concern himself with the theoretical controversies of the doctrine, nor does he turn his attention to the productivity of other industries in the country unless they affect his business, directly or indirectly. Take the case of a silk manufacturer who produces certain goods and puts them on the market for sale. To his disappointment, he finds that similar goods of foreign origin are offered at prices lower than his own and are therefore much in demand. He obviously feels the pressure of foreign competition, and is thus induced by force of circumstances to investigate the causes which led to the success of his foreign competitor. There is no doubt that under normal conditions, by which we mean conditions of free development,² the foreign competitor must have a com-

¹ See Taussig, "Some Aspects of the Tariff Question," p. 30.

² That is, excluding those industries which are fostered by the State for national reasons only.

parative advantage in the production of those goods which can compete successfully in external markets and not in the manufacture of those which cannot ; but this does not solve the problem of the silk manufacturer in question. His practical interest is not involved in the flow of capital and labour from a less remunerative industry to a more remunerative industry in a foreign country, but is concerned directly with the advantages and facilities for production which the foreigner enjoys, and he goes without. These advantages may be economic or commercial, or both. Therefore, in considering the principle of comparative advantage from the silk manufacturer's point of view, and in determining the factors which enter into foreign competition, we would be justified in avoiding the current controversies and in stating the facts of the case as they exist.

Another point, which makes it impossible for us to apply the doctrine of comparative cost in its rigid form to the present inquiry is the technical importance of the silk industry to the other textile industries of the United Kingdom. To an outside observer, and also, perhaps, to a theoretical economist, it would appear absurd to preserve an industry in which labour and capital do not work to greatest effect and which can be displaced by many other more remunerative industries. But the general opinion of the trade itself, though one-sided, is convincing in its arguments, which explain the benefits which the other textile industries derive from a prosperous silk industry. In one of the recent reports on textile trades, it is clearly shown that " the silk industry represents the high-water mark of technical attainment among textile industries." The following passage from the same report is significant : " It has been represented to us that it would be impossible to maintain the highest standard of technical training, knowledge and skill in other textile trades if the higher branches of the silk industry were allowed to die out in this country. This is one important reason we are told why the decline of the British silk industry is to be deplored. Witnesses suggest that the United Kingdom should maintain the silk industry for the sake of its more flourishing sisters, on the ground that it represents the

crown and apex of technical attainment in textiles, and that the other branches must inevitably suffer from its decay.”¹

The passage quoted above needs no explanation. If the silk industry must be preserved for national reasons, it must be made profitable for those engaged in it, and its products must compete successfully with the products of foreign silk industries in at least the home market. Thus it is obvious that the doctrine of comparative cost as understood in economics cannot be applied to all the branches of the British silk industry, as, even although capital and labour could be applied more profitably to some other industries, it is considered desirable for national reasons to preserve the higher branches of the silk industry.² We shall therefore consider the factors in foreign competition not in the light of the strict phraseology of the doctrine, but from the point of view of the silk manufacturer who wants to know why the final competing price of the foreign goods is lower than that of his own. In analysing the facts we shall have occasion to refer to the terms of the doctrine, but this we shall do without touching upon the purely economic controversies.

The first important point in the present discussion is the part played by the cost of production in the determination of the final competing price. An insight into the actual manufacturing conditions would show that the failure of some of the British silk goods to compete with continental goods in price is due mainly to the higher cost of production in England. But this statement is too vague to convey a definite idea of the fundamental differences in manufacturing conditions between the two cases under review. It is therefore necessary to give a brief analysis of the cost of production in order to show in what way the continental countries are better placed than England as regards silk manufacturing.

This problem is beset with many difficulties, most of which arise out of the variations in the conditions of production. In the first place, the three principal branches of the silk industry form individual economic entities, and therefore the

¹ Report on Textile Trades after the War, 1918, p. 81.

² Strictly speaking, the silk industry may be regarded as a “key” industry on account of its importance to the other textile industries.

items entering into the cost of production in one branch cannot be introduced *in toto* into another branch. In the second place, the cost of production in each of the three principal branches varies with the quality and the quantity of the commodity produced. The finer the quality, the higher is the percentage of the cost of production paid out in wages, and the larger the quantity of the goods manufactured, the lower is the unit cost of production. In the manufacturing branch, considering, for instance, the production of rich brocades and figured velvets, we find that the cost of designing and workmanship exceeds that of the raw material. In throwing, as also in spinning, the finest counts of yarns cost more to produce than the coarser counts, as the former require a more careful manipulation and finish than the latter. In the third place, the scattered distribution of the silk industry in Great Britain so veils the situation that it is extremely difficult to secure an accurate estimate of the cost of production in the individual branches of the industry. The differences in the general economic conditions, which include the rates of wages, local rates, rent charges, between two distant localities cause marked variations in the estimates of the cost of production, and therefore the generalisation of the principal items becomes inaccurate.

In the presence of these conflicting elements, we shall confine our attention only to the most important items in the cost of production. The first important item in the cost of production is the labour bill. As we have remarked previously it is impossible to give exact figures regarding the proportion of labour charges to the total cost of production in each branch of the industry owing firstly, to the fundamental differences in the nature of the different branches, and secondly, to the varying nature of the goods produced in each branch. But for purposes of a general analysis, we may say that in the throwing and spinning industries the general level of labour charges is almost the same, and is generally about 30 per cent. of the total cost of production. In the manufacturing branch the labour charges vary from 20 to 50 per cent. of the total cost of production according to the quality of the manufactured article.

Our next step is to find a relation between the labour charges and the rates of wages. We have observed in a previous chapter that in France, as also in some parts of Italy, the throwing industry is intimately associated with the reeling industry, and the general economic conditions in the former are greatly influenced by those in the latter. One of the most important features of this association is the equalisation of the rates of wages in these two industries, and its subsequent effect on foreign competition. It may be stated without exaggeration that the wages paid to the workers in the French throwing industry are nearly 50 per cent. less than those paid in the British throwing industry. If the estimate of the cost of production of thrown silks be based on this statement, it will be found that the French throwster pays 50 per cent. less for labour than the British throwster, whose cost of production is therefore 15 per cent.¹ higher than that of his continental competitor. The British silk-spinning industry also suffers from a similar competition. The rates of wages in France, Italy and Switzerland are much lower than those in England, and for this reason the spinners in the latter country find it impossible to produce spun silks as cheaply as their continental competitors.

Here it might be justifiably asked why does the English spinner steadily export spun yarns to other countries notwithstanding the higher wages which apparently constitute a handicap for him. The answer to this question leads us to a consideration of the efficiency of the British producers in particular branches of the silk industry. As we have shown previously, the development of the English silk-spinning industry has been marked with specialisation and its early growth has taken place in the midst of favourable circumstances, such as a highly developed cotton-spinning industry, the neighbourhood of textile machinery manufacturing area, and the presence of an adequate supply of suitable labour. These circumstances, combined with the effective use of high-speed spinning machinery enabled the English spinners to produce the finest counts of yarns, and in spite of the obstacle

¹ As labour charges are about 30 per cent. of the total cost of production in throwing.

of high wages, the spinners not only held their own against foreign competition, but succeeded in finding markets for their products in other countries. The English spinners have therefore defeated foreign competition by dint of their higher efficiency in spinning which constitutes a comparative advantage. It might be observed here that it is possible to apply the doctrine of comparative cost to the spinning branch of the silk industry. The throwing branch has been gradually abandoned, and capital and labour have both found their way into spinning in which they work with greater effect than in any other branch of the silk industry.

On the other hand, the manufacturing branch of the British silk industry tells a different tale. Here the difference in the wages between the United Kingdom and continental countries is marked, but there is no comparative advantage to counteract the effects of difference in wages. Neither the weavers nor the dyers possess higher technical skill, and even the machinery is by no means up-to-date; so that the British manufacturer is compelled to face the competition of the lower continental wages without any compensating advantages. The most significant fact is that, although the domestic industry has greatly declined, and the number of hand looms has considerably diminished during the last thirty years, there has been no progress in the factory. The continental countries, on the other hand, have maintained their cottage industries. In France, Switzerland, Italy and also in Germany, household production of silk fabrics still plays a very important part, and the hand loom continues to be used for the manufacture of broad and narrow silk goods. In Basel, as also in Elberfeld and in the environs of Crefeld, the factory and cottage industries exist side by side. It is due partly to this form of organisation that the continental manufacturers are able to produce silk goods cheaper than the English manufacturers who possess neither the benefits of a cottage industry nor the economies of large scale production in a factory. It is difficult to say which of these two systems is beneficial to the ultimate prosperity of the silk industry or to predict which one would survive in the long run, but it is evident,

however, that in the absence of a highly developed factory system, the cottage industry offers more opportunities for cheaper production than does the factory. In the first place, the utilisation of water power for purposes of obtaining electricity for small household motors reduces a part of the current charges and enables the weavers to produce goods in their own homes. In the second place, even if the weavers are engaged by some contractor manufacturer, the wages paid are, as a rule, lower than those paid in a factory situated in the suburbs of a large manufacturing town. These two conditions explain the difference in the cost of production between the United Kingdom and the Continent.

With regard to the American silk industry, it is interesting to note that, apart from the operation of the protective tariff policy, the success of competition in certain classes of silk goods has been due entirely to the effective use of specialised machinery. The manufacture of ribbons is a typical example of this achievement, but in the manufacture of other goods also which satisfy the popular demand, and which can be turned out in large quantities of the same pattern, machinery has played the most important part. The demand for new machinery has resulted in a great expansion of the silk machinery manufacturing industry. The following extract from a report by a member of the Silk Association of America describes the position of the silk machinery market in 1916¹: "The general condition of the silk industry market in every line is extremely flourishing to-day. Silk manufacturers are adding to their equipment and are also replacing much of their old machinery with the newest and most up-to-date equipment. Many new concerns are also springing up in all quarters and their purchases amount to considerable. It might be well to add at this time that these new organisations are demanding from the machinery manufacturers their very best product, and very few concerns entering the silk business at this time are purchasing second-hand, and practically no inferior machinery is being bought."

¹ See the Forty-fourth Annual Report of the Silk Association of America, 1916, p. 71.

“ The improvements added to the machines used in connection with the silk trade are many, and have naturally been called forth by the varied conditions which have arisen during the past few years. It is natural to expect that the improvements added have greatly increased the efficiency and convenience of the various machines. Increases in prices have already taken place, and no doubt will continue to follow, both on account of increased costs of material and labour, but also from the fact that these improvements have been made which are, in many cases, a new addition or added feature to the present-day machine.”

It is evident from the above extract that the American silk industry possesses a comparative advantage in the wide and progressive field of silk machinery manufacturing, and that the manufacturers make the best use of the new types of machinery which increase the output and reduce the cost of production. The obstacle presented by the high wages in the United States is overcome by the continued introduction of labour-saving inventions which increase the total amount of production in such a way as to reduce the cost per unit.

It must be remembered, however, that the American manufacturers have not been able to check the imports of those fabrics in which the quality and design are executed by human workmanship. These fabrics are produced on the hand loom, and their production is not regarded as a profitable industry by the American manufacturer, who pays high wages and whose genius for organisation shines best in a large manufacturing industry which requires the use of machinery. The British manufacturer is also fully alive to the benefits of large scale production and the use of up-to-date machinery, but in his case, the spirit of enterprise has been so much affected by the disastrous effects of foreign competition that fresh capital for new plant and machinery is not readily forthcoming. If he enjoyed the same conditions of protection as does the American silk manufacturer, perhaps there might be an increased tendency on his part to replace the old machinery with new and to introduce latest improvements into his works, but under the present conditions there

is no possibility of any material extensions in the British silk industry.

After having considered wages and machinery, we might now refer to certain other charges which form a part of the cost of production. These include management charges, rents, salaries and commissions. In Great Britain the general scale of these charges is fixed not only by the conditions prevailing in the silk industry, but also by the standard prevailing in other more prosperous textile industries, with the result that even although returns to production are lower in the silk industry, than in the cotton and woollen industries, the general standard of these charges is almost the same in the former as in the latter. In France, Switzerland, and Italy in particular, the standard of these charges is much lower than in England, and therefore the cost of production in the former countries is proportionately lower than in the latter. It is true that the difference in these charges between the continental countries and the United Kingdom is not so great as to cause appreciable difference in the cost of production per unit, but it cannot be denied that even very slight differences in these charges constitute a comparative advantage for the successful competitors.¹ For this reason we cannot ignore these items of the cost of production while considering the factors in foreign competition.

The next important point which enters into the present discussion is the continuity and extent of production in the British silk industry. We have already remarked that the displacement of British silk goods in the home and foreign markets by continental goods resulted in a decline in the amount of home production. After the foreign goods had established their position in the British market, the demand for British goods became unstable, and consequently production lost its characteristic continuity,—a feature which is essential to keep the cost of production low. The inevitable result of the decline in the demand for home-made silk goods was that the manufacturers became sceptical about their

¹ Exact figures for these charges are not available, but it may be assumed that the increase in the cost per unit owing to these charges is about $\frac{1}{4}$ per cent. in England as compared with the continental countries.

trade and could not afford to keep their machinery running. The effect of foreign competition was twofold. In the first place it reduced the output of silk goods in Great Britain, and in the second place, it raised the cost of production by rendering the trade intermittent. A good deal of information on this point is contained in the report of the Tariff Commission. The following passage from the statement of a manufacturer of silk piece goods might suitably be quoted here to illustrate the effect of "continuous running" on the cost of production: "As to the difference in cost of production between continuous grade and short time, it is very important, and in this connection I may remark that what is required by our trade and probably most manufacturing trades in this country, is not so much higher prices as more and steadier business, and it is this consideration more than any other that makes me of opinion that no ultimately appreciable increase of price to the consumer would follow the imposition of a moderate tariff. The lowering of cost of production would be a certain result of increased business. Let me take my own concern. There are certain items of yearly expenditure which are fixed, and certain others which, while not absolutely fixed, are necessarily much higher in proportion to turnover in a time of restricted output than when the establishment is working full time. Taking a normal year's output and last year, which was very bad, the difference in cost of production works out about 6 per cent."¹

It will be seen from the above passage that in the first place, there is hardly any reduction in the fixed annual charges even if the factory does not run full time, and in the second place, the current charges are "higher in proportion to turnover in a time of restricted output than when the establishment is working full time." It is therefore more profitable for the manufacturer to run his machinery full time than half time, as by doing so, he can increase his output and reduce the cost of production per unit of product. The principle underlying the system of "continuous running" is that it enables the manufacturer to distribute both the fixed and the current charges over a

¹ See Report of the Tariff Commission, Vol. II., Part VI., par. 3152.

larger number of units of the commodity produced and thus ultimately lowers the final competing price. But as we have observed in the last paragraph, the success of the manufacturer in this direction depends on the continuity and extent of the demand for his products. In the case of the British silk manufacturer, these two conditions are generally unstable owing to the increased demand for cheaper foreign goods, while in the case of the continental manufacturer "continuous running" is rendered possible by the continuity of the demand for silk goods in both the home and foreign markets. It is therefore clear that in addition to the advantages of lower wages and lower management charges, the continental manufacturer possesses another comparative advantage in "continuous running" which places him in a more favourable position than the British manufacturer as regards the cost of production.

Leaving purely economic considerations aside, we find that on the commercial side the principal factor in foreign competition has been what is generally known as the "two market system," according to which the continental manufacturers sold their goods at a considerable profit in the home markets and disposed of their surplus stocks at cost price in the British market. This policy was directed against the British manufacturer whose goods could not possibly compete with the continental goods in prices owing to "dumping." The success of the foreigner was due to more than one reason. In the first place, the protective policy adopted by France, Switzerland, Italy and Germany enabled the manufacturers in those countries to expand their respective home markets, nay, even to prevent the incoming of British goods in some cases. The British market, on the other hand, was free and open after the year 1860, and this offered the foreign manufacturer an additional outlet for his goods, with the result that he had two markets at his disposal, both of which helped him in increasing his production. In the second place, the protective policy enabled the continental manufacturer to raise the prices of goods in the home market to such an extent as would allow of goods being sold in the British and colonial markets at nothing more than the cost

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The British goods entering the French or the Italian were subjected to heavy duties and were unable to compete successfully even with the inflated prices of the continental goods. The continental manufacturers, on the other hand, disposed of their surplus stocks in the British market at very low prices after having realised their full profits in the home markets. Moreover, the facilities offered by an open market in Great Britain enabled the Swiss and Italian manufacturers to keep their looms running throughout the year and to produce on a large scale, thereby reducing their cost of production. In the third place, the combinations of silk manufacturers and of silk spinners in France and Italy have had a considerable influence on the marketing of goods. These combinations have been able not only to influence the prices of the raw material by buying large quantities at a time, but also to regulate the prices of yarns and finished goods. In some cases they have exercised considerable control on the determination of prices in the home and export markets. Before the war several combinations of silk manufacturers existed in Germany, which acted in a manner similar to the French and Italian combinations and issued circulars to their members on the regulation of prices in the home market. The effect of this regulation of prices, however, generally extended to the British market, which formed an open outlet for their surplus stocks. It might be observed before concluding this part of the discussion, that the activities of the continental combinations succeeded because of the protective policy which enabled the promoters to regulate market conditions according to circumstances.

We have so far examined the principal factors in foreign competition, and have shown in what way the continental silk manufacturer is placed in a more favourable position than the British manufacturer as regards the production of silk goods. The comparative advantage in the case of the successful competitor lies not only in the more suitable economic conditions, but also in the system of marketing which is greatly assisted by the protective tariff policy. The obstacles in the manufacturing of certain classes of silk goods

in Great Britain are economic and not physical. There are, however, certain characteristics of the British industrial system which tend to remove these obstacles and facilitate production ; but these characteristics, as we have observed, are a safeguard against foreign competition only in the manufacture of those products which demand a high standard of technical efficiency in the effective use of machinery and qualitative superiority in large scale production. The last two points are illustrated in the production of the finest counts of spun yarns and in the progressive march of the silk spinning industry. The success of the American silk industry, which differs vastly from the silk industries of the continent, has also been due to the extensive employment of labour-saving appliances, and enormously large scale production. The complete conquest of the hand loom by the machine in the United States is a feature which differentiates the American silk industry from the silk industries of the continent and points to the existence of a comparative advantage in the manufacture of those silk goods which are in demand in every day life. The British silk industry, on the other hand, possesses neither a household industry nor a highly developed machine industry for the manufacture of broad piece goods and ribbons, and is therefore unable to stand in competition with either the continent or with the United States. But the pivot of the whole problem when other conditions are set aside, is the operation of the protective tariff policies of the competing countries on the position of the British silk industry. The problem of foreign competition remains unsolved without a clear and well-considered analysis of the tariff policies of the various silk manufacturing countries, as, in the long run, it is due mainly to protection that the competing countries have been able not only to make the best use of the existing economic advantages in production, but also to deliver a fatal blow to the British silk industry in the commercial field. We shall now turn our attention to the problems involved in the protective policies of the competing countries and their bearing on foreign competition.

CHAPTER XX

TARIFFS AND THE SILK INDUSTRY

THERE are very few British industries which have been affected as much by the protective policies of the competing countries as the silk industry. The early history of the import duties on silk goods of foreign origin imported into the United Kingdom commences from the year 1760 and presents some very interesting economic features.¹ The struggle, which lasted nearly a century with several variations in the rates of duties and their corresponding effects on the economic position of the silk industry, ended in the year 1860, when even the last remnant of the tariff policy was removed under the terms of the Cobden Treaty. The removal of the 15 per cent. duty on French and other continental silk goods thus marked not only the beginning of the era of free trade but also the commencement of the decline of the British silk industry. The evidence contained in the Parliamentary Report of 1832 is instructive and clearly explains the influence of the changes in the tariff rates on the condition of the silk industry at different periods. The conclusions of the Commission, based on the evidence obtained, suggest that the periods during which the import duties were the heaviest enjoyed the greatest prosperity. This statement by no means indicates that free trade is a fatal policy; its main significance lies in the fact that silk manufacturing as an individual industry cannot bear the pressure of foreign competition without protection, and that up to a definite limit,² the greater the protection the greater is the prosperity of the industry. It is true that the cotton and woollen

¹ For full information on this part of the subject the reader may refer to the Parliamentary Report on the State of the Silk Trade, 1832.

² Beyond the maximum limit of protection (which depends largely on the conditions of international trade) the tariff may have an opposite influence on the position of the silk industry.

industries have continued to prosper even under free trade, but it must not be forgotten that they had the advantage of a much earlier start, and their industrial and economic position was fully strengthened long before the competing countries entered into the field of competition. These industries, moreover, enjoyed the benefits of early mechanical inventions which the competing countries were not in a position to adopt for a long time. Thus fortified by several comparative advantages, these industries not only maintained their prosperity, but also enhanced it under the free trade policy. On the other hand, the silk industry laboured under several disadvantages, such as a later start, absence of mechanical inventions in the early years of its history, dependence on foreign artisans, and the presence of a keen foreign competition at the very commencement of silk manufacturing in Great Britain. Under these circumstances, which obviously constituted industrial and commercial handicaps, it was impossible to foster a silk industry without some sort of protection.

As we have already indicated, the prosperity of the British silk industry before the year 1860 rested on the tariff policy—a subject which is full of many complicated problems. In view of the fact that the main object of the present volume is to deal with the problems having a direct or indirect bearing only on the production and the consumption of raw silk, it will be unnecessary to devote too much attention to the economic evolution of the tariff policy as a whole. But as the consumption of raw silk in the British silk industry has greatly declined since the innovation in the fiscal policy, it is important to discover the causes which led to this decline. Some of the fundamental causes of industrial and economic importance have already been discussed in the last chapter dealing with the factors in foreign competition. In addition to those causes the tariff problem plays an active part in determining the trend of foreign competition, and it is with a view to finding the influence of this last factor that we shall examine briefly the arguments relating to the imposition of duties on silk goods and their effect on the silk industries of the competing countries.

It might be observed here before proceeding with the actual subject, that the tariff problem does not affect the importation of the raw material. In all the manufacturing countries raw silk is imported free of duty. The reasons for the adherence to the free trade principle by the manufacturing countries in this direction are quite obvious. Among the silk manufacturing countries the United States, Germany, Switzerland, England and Belgium have no domestic production of raw silk and depend mainly on the Far Eastern supplies, and partly on the French and Italian exportations for their raw material. These countries are thus naturally prevented from imposing any duty on raw silk. In Italy, France, Austria-Hungary, Spain and Russia, the domestic production of raw silk is not large enough to meet the home demand—and therefore some of these countries are forced by their manufacturing requirements to import large quantities of the raw material from the Far East. In either of these two cases the natural and industrial conditions demand the free importation of the raw material.

When the raw silk passes through a stage of manipulation either by the hand or by the machine processes, it becomes liable to an import duty in certain manufacturing countries, particularly in France and the United States. Strictly speaking, raw silk in its semi-manufactured state, that is when it is thrown into tram or organsine, forms a raw material for the manufacturing industry, and on this ground might be admitted free of duty; but in order to safeguard the interests of their throwing industries, the countries referred to above regard the imposition of an import duty on thrown silk as a beneficial protective measure. The throwing industry of the United States is protected by an *ad valorem* duty of 15 per cent. plus a specific duty of about a dollar per pound,¹ and the French throwing industry enjoys a protection of 3 francs per kilogramme. In Switzerland there is no import duty on organsines (thrown silk for the warp), while trams (thrown silks for the weft) enjoy only a very

¹ The rate of the specific duty depends on whether the thrown silk is imported in singles, trams, or organsines, and also on whether it is in the gum or degummed.

small protection. In Italy the fiscal policy does not help the throwing industry to any great extent.¹ It appears from the information at our disposal at present that among the continental countries France offers the greatest protection to her throwing industry, and thereby guards it against foreign competition in the home market by a process of exclusion. In the other continental countries, although the throwing industry is protected, it is protected to a much smaller extent than in France. This difference in protection between France on one side and Italy and Switzerland on the other, is probably due to the greater security and confidence which the latter countries enjoy.

As regards the dependence of the throwing industry on protection in various countries it is extremely difficult to give a conclusive opinion which would include each and every case. In so far as the British throwing industry is concerned, it is obvious from the evidence which we have examined in the chapter before last that after the removal of protection the industry began to decline, and finally dwindled into an insignificant size owing to the increased importation of French and Italian thrown silks. This downfall of the industry indicates that the foreign competitor could (and still can) produce thrown silk cheaper than the British throwster, and that the latter depended on protection to the extent of the amount of protection granted to him under the tariff system. The French industry, it is held, has maintained its prosperity on account of the 3 francs per kilo. import duty on foreign thrown silks, but it is impossible to say whether the conditions prevailing in the French throwing industry would deteriorate in the absence of protection. The statements showing the gloomy aspects of free trade sometimes emanate from the interested parties and in these cases we cannot place too much reliance on them.

It may be noted here that the American throwing industry was greatly aided by protection during the early years of its development. Even till the late "eighties," foreign thrown

¹ According to the tariff regulations which came into force in 1906, only dyed thrown silks were subject to an import duty of 0.5 francs per kilogramme.

silks were imported into the United States. But by the year 1890 various mechanical improvements had been introduced into the throwing industry and the spindles were running at the rate of 10,000 revolutions per minute. From 1890 to 1900, the industry saw further advances in automatic machinery which not only raised the output of the American throwing mills, but also reduced the quantity of highly paid labour to a minimum. "The throwing industry," remarks Mr. Mason, an American economic investigator, "is now in a position independent of the tariff and impregnable from the assaults of foreign competition."¹ The same writer further maintains that in relation to the American throwing industry "the tariff on thrown silks is a useless incumbrance." It is impossible to find a more impartial opinion than that of an investigator who studied the problem from a purely economic point of view. Relying on this information, we cannot deny that although the throwing industry in the United States depended on protection during the early years of its development, the later stages became independent of the tariff owing to the introduction and the effective use of high speed and automatic machinery, by which a considerable number of economies were effected in production.

It is well known that the general economic conditions in Great Britain are more similar to those prevailing in the United States than those prevailing in the continental countries. Bearing this comparison in mind, one might ask: Would the British throwing industry develop and flourish under those conditions of protection which ultimately made the American industry independent of the tariff? This question cannot be answered without scrutinising the economic details of the problem. In the first place we cannot lose sight of the fact that at the time of the removal of protection in 1860, the silk industry, as a whole, and the throwing branch in particular, did not enjoy the benefits of mechanical inventions and automatic machinery. Under these circumstances the British throwster could not compete

¹ See "The American Silk Industry and the Tariff," by Mr. Frank R. Mason, in the *American Economic Association Quarterly*, December, 1910, p. 115.

successfully with the continental throwster who possessed a comparative advantage not only in lower wages, but also in an environment rendered more suitable by the presence of a reeling industry. The natural consequence of an open market in Great Britain was that the French and Italian throwsters, aided by more favourable conditions for production, began to supply the British manufacturer with thrown silk. The industrial conditions prevailing in the textile industries have, however, changed enormously since the beginning of the free trade policy and the silk industry has also witnessed many mechanical advances during the last thirty years. It is possible that under the new *régime* of high speed and automatic machinery the British throwing industry may again see prosperous days. But as we have pointed out repeatedly, the spirit of enterprise which has been greatly affected by the depressing consequences of foreign competition cannot be re-inculcated without granting the throwing industry a partial protection. Perhaps in the beginning the silk manufacturers, who are the actual consumers of thrown silk, would object to the imposition of a small import duty and declare that it would tend to raise the prices of their raw material, but after the period of transition when the industry becomes the master of the situation and can produce thrown silk as cheaply as do the continental industries (owing to the introduction of mechanical improvements) the manufacturers' complaint would be removed. But in the long run the question is one of experiment, and therefore it is risky to give a decisive opinion. The future may bring forth new and more profitable industries and may completely draw away labour and capital from the moribund industries.

The next main division of the silk industry which calls for scrutiny and careful consideration in relation to the tariff problem is the manufacturing division. The application of the tariff involves a much greater number of complexities in this division than in any other. Some of the difficulties are of a purely technical nature while others arise out of the widely differing methods of classification of silk goods adopted by different countries. But whatever the system of

classification may be, the principles on which the policy of protection is based are almost the same in all cases. Briefly speaking, the tariff performs three distinct functions. In the first place it tends to decrease the importation of goods of foreign origin into the protected country, and thereby tends to exclude the foreign competitor from the markets enjoying the benefits of protection. This statement, of course, implies that the import duty is imposed on goods of the same character as are produced by the protected industry or could be profitably produced in the presence of protection. In the second place, the tariff tends to check the export trade of the competing country in those goods which enjoy protection in the home market. The second function is thus intimately related to international competition and trade in silk goods. Lastly, a well regulated tariff is responsible for the rapidity with which the silk industry develops in a protected country when other factors in production are favourable from an economic point of view.

The three functions of the tariff, though individually distinct, are interrelated to each other as regards their ultimate effect on the silk industry and trade. This interrelation may be summed up into one leading function of the tariff which offers the protected silk industry opportunities for acquiring the mastery of the home markets and for gradually extending its commercial activities to the external markets. The mastery of the home markets depends firstly on the economic production of those goods which are greatly in demand in the home markets, and secondly, on the soundness of the fiscal policy. Success in the foreign markets can be achieved only if the home industry is capable of producing silk goods cheaper than the silk industries of the foreign countries in spite of all commercial barriers.

The next two questions which arise out of a consideration of the functions of the tariff are: How far has protection actually succeeded in developing the production of various silk goods in the protected countries and what were its actual effects on the production of those goods in Great Britain? The first question cannot be answered without referring briefly to the development in the production of particular

classes of silk goods in the Continental countries and in America, and the answer to the second question involves a brief review of the decline in the production of those goods in Great Britain. In order to solve these two questions and to show the practical importance of the tariff, we shall now refer to its effects on the silk-manufacturing industries of those countries which have maintained or even enhanced the interests of their industry by means of protection and also of those which have become independent of foreign supplies of silk goods through the operation of the tariff.

First of all let us take the French industry into consideration, which, as is well known, is one of the oldest in Europe. It has enjoyed continued protection ever since 1892. It was a year or two before this period that the Lyons and St. Etienne silk manufacturers began to feel the pressure of foreign competition in goods, such as the pile fabrics of Crefeld, the ribbons of Basel, and the taffetas and satins of Zurich. The success of this competition caused great anxiety to the manufacturing interests and led to the adoption of a complicated protective policy in 1892.¹ It cannot be maintained that the policy of protection succeeded in completely stopping the importation of competing goods, but it may be legitimately held that the imposition of a tariff on these goods compensated the French manufacturer for the comparative disadvantage in the higher cost of production, and thus secured for him a stable position in the home markets. This security resulted in the maintenance of production on a large scale of velvets, taffetas and other competing goods by the home industry, and thus prevented a possible decline in the exportation of these goods from France. Thus the tariff protected the interests of the French manufacturer not only in the home markets, but in the external markets as well.

As regards the German silk industry, we have already noted

¹ The system of imposing import duties on silk goods adopted by France, Italy, Germany and Switzerland is very complicated. It is generally based on the specific duty method, and varies with the nature of the commodity taxed. Moreover, the rates of import duties are changed frequently. For these reasons it is impossible to give the exact rates of duties in the present volume.

that the protective policy performed a double function. In the pre-war days the German silk manufacturers used to dispose of their surplus goods in the open British market on account of the protection which they enjoyed at home. The development of the German silk industry and the success of its products in both the home and the external markets were due partly to the fiscal policy adopted by the German Government and partly to the system of combinations, which assisted the silk manufacturers in regulating the prices of goods in those markets to which they had an easy access. Some of the velvet manufacturers went so far as to form a Franco-German "cartel" in 1908, in order to control output and prices.¹ This "cartel," assisted by the protective policies of the two countries, succeeded in securing a mastery not only of the French and German markets, but also of the colonial markets. In the beginning of the war, however, the activities of this combination came to an end. But, even apart from the influences of combinations, we may safely assume that the development of the German silk industry was not independent of protection.

The development of the Swiss silk industry was governed by protection to a much smaller extent than that of either France or Germany.² The chief reason for the comparatively less dependence of Switzerland on protection is that the consumption of silk goods in the home market is very small as compared with that in the other silk-manufacturing countries, and therefore it is not necessary to impose heavy duties on the imports of silk goods. The small tariff imposed on goods of foreign origin is sufficient to counteract the influence of foreign competition on the home industry.

The next two countries whose tariff policy might be considered here are Austria and Russia. During the last decade of the last century the Austrian silk industry made rapid strides, and by the year 1898 the number of power looms had

¹ See the Diplomatic and Consular Report, France, No. 4691, 1911, p. 26.

² While in France and Germany the average duties on silk goods were 4 francs and 5.62 francs per kilo. respectively in 1906, in Switzerland the average import duty was only about 1 franc per kilo. (or a little over on certain goods).

already exceeded 8,000.¹ In 1910 the number of power looms was probably more than 12,000, and that of hand looms about 3,000. The causes of the development of the Austrian silk industry and of the ultimate independence of the Austrian silk market of foreign goods are not very far to seek. In the first place, the heavy import duties of about 11 francs per kilo. on velours and of about 5 to 10 francs on other silk fabrics checked the importation of these goods into Austria.² In the second place, this marked protective policy induced the British and the French silk manufacturers to establish silk mills in Austria in order to avoid the payment of heavy duties. It has been declared more than once by some of the British manufacturers that British textile machinery and skilled labour played a very predominant part in the elevation of the Austrian silk industry to the position which it had attained by the beginning of the present century. It appears from the accounts of several throwsters and merchants that one of the first effects of the rigorous Austrian tariff policy on the British silk trade was a decline in the exportation of thrown silk to Austria. The advancement made by the throwing industry was soon directed towards the establishment of a manufacturing industry, and by the end of the last century Austria was in a position to export velours, dress silks, tie silks and mufflers to British and other markets at low competing prices. In this case therefore the tariff performed three different functions. In the first place, it reflected seriously on the position of the British silk industry, and arrested the exportation of thrown silk and manufactured goods from Great Britain to Austria; in the second place, it caused the transference of capital and labour from England to Austria—a process which resulted in the development of the Austrian silk industry to the detriment of the British manufacturing interests; and lastly, the tariff became the means of building up an export trade in silk goods for Austria. The outbreak of the European war caused considerable industrial dislocation in practically all the countries involved, and it may be assumed

¹ See "Histoire Economique de la Soie," by M. Beauquis, p. 462.

² *Ibid.*, p. 286.

that, like every other industry, the silk industry in Austria also suffered from the usual disadvantages arising out of war conditions. It is impossible to predict at present the future of the Austrian silk-manufacturing industry and the influence of the possible competition of its products on the British silk industry and trade, as the course of future international competition depends not only on the mechanical advancement of the silk industry, but also on the commercial and fiscal readjustments which are likely to follow the conclusion of the peace treaties.

The Russian tariff policy had also a very disastrous effect on the exportation of thrown silk, silk crape, and mixed goods from Great Britain to Russia. The heavy import duty, amounting to about 100 per cent. *ad valorem*, was simply prohibitive from the point of view of the British manufacturer, who could not possibly succeed in his enterprise in a highly protected market. It is needless to deal with the history of the Russian silk industry here, but it is necessary to point out that the Russian tariff policy ultimately made the Russian market independent of British supplies and thereby caused a reduction in the amount of British export trade in silk goods with foreign countries.

We might now examine briefly the part played by the tariff in the development of the American silk industry. The duty on silk manufactures had been moderate until 1861. In that year it was raised twice, first from 24 per cent. to 30 per cent. and then to 40 per cent.¹ But towards the close of the civil war in 1864 it was fixed at 60 per cent. It appears from various investigations that the original object of imposing this heavy *ad valorem* duty was simply to increase the revenue. "The increase," maintains Professor Taussig, "was solely for revenue, with no trace of that admixture of protectionism which was a factor in so much of the tariff legislation of the period."² This high tariff of 60 per cent. remained in force until 1883, when the rate was lowered to 50 per cent. Until the year 1897 the general *ad valorem*

¹ See "The American Silk Industry and the Tariff," Mason, p. 56.

² See "Some Aspects of the Tariff Question," by Professor F. W. Taussig, p. 218. I have obtained a good deal of information on the American silk industry from the two books referred to above.

system of imposing duties on imports prevailed in the United States. Velvets and pile fabrics were, however, an exception to the rule ; the duties on these goods had already been made specific in 1890. In 1897 an elaborate and complicated system of specific duties was adopted, and though apparently it was held that the new system was introduced mainly to check fraudulent under-valuation, its actual effect was to raise the previous duties " above the point of prohibition." The Tariff Act of 1909 did not touch the specific rates of 1897, but the revision of 1913 resulted in a reversion to the old *ad valorem* system. The rates of these *ad valorem* duties were kept comparatively high, varying from 45 per cent. on most fabrics to 50 per cent. on velvets and plushes, and to 60 per cent. on laces, embroideries and silk trimmings.

The American silk industry was of a very insignificant size before the commencement of the era of high protection. It is borne out by the course of subsequent development in silk manufacturing in the United States that the 60 per cent. duty of 1864, which was originally designed for emergency revenue purposes, served as an active stimulus to the growth of the American silk industry. In order to confirm this opinion, we cannot do better than to quote Professor Taussig, an eminent authority on tariff problems. " Summing up," he holds, " we may say that the silk manufacture during the half-century that followed the civil war was sheltered by a high barrier on imports. In this case, as in others, duties originally imposed for emergency revenue purposes became protectionist in their effect, and then, with the accentuation and systematisation of the protective system, were made more rigorous." ¹ In another place, he concludes that " the peculiarities of the raw material and the long-standing traditions of the industry interposed at the outset obstacles which would almost certainly have prevented ventures into this new field but for the stimulus from protection." ² The principal obstacle in the way of successful silk manufacturing was that the general level of wages was (and still is) much higher in the United States

¹ Taussig, " Some Aspects of the Tariff Question," p. 219.

² *Ibid.*, p. 257.

than in the competing countries. There is no doubt that in the beginning the heavy import duty considerably raised the prices of imported silk goods to the consumer, but as the home industry began to establish itself and as cheaper production became possible on account of the use of automatic machinery and the introduction of labour-saving appliances the prices of home-made articles became lower than those of the foreign competing goods. Thus in about a couple of decades after the adoption of the high protective policy the manufacture of plainer kinds of silk goods and those of repeating patterns, such as simple ribbons, plain dress goods, upholstery trimmings of uniform patterns, and the ordinary kinds of braids, became as cheap in the United States as in the competing countries. But it must be remembered that the high protection could succeed in fostering and developing only those branches of the silk industry which were best suited to American conditions of production, that is, those branches whose prosperity depended on the effective use of high speed automatic machinery and specialised power looms. The manufacture of those goods which necessitate the use of the hand loom, and whose market prices are governed by their exclusive designs and uncommon characteristics, has always been unsuited to the American methods of production, and therefore, in spite of the tariff barrier, they have been continually imported into the United States for the use of the wealthier classes of the community. We may therefore conclude that in the manufacture of standardised products the tariff has successfully performed its essential functions, but in the case of those goods which cannot be manufactured profitably in the United States it has served no definite purpose.¹

It will be interesting to consider now the influence of the American tariff policy on the position of the British silk industry. In this connection the manufacture of pile fabrics, that is, plushes and velvets, calls for special attention. It will be remembered that, although the 60 per cent. duty remained in force until the year 1897 in the case of pile

¹ As the demand for highly specialised goods is limited, the import duty on these goods cannot be expected to yield a substantial revenue.

fabrics, this method was changed in 1890, when a specific duty, equivalent to 75 per cent. *ad valorem* was imposed on these goods. This high tariff barrier reacted rather seriously on the exportation of pile fabrics from Great Britain to the United States and induced some of the manufacturers to transfer their plant and machinery to the latter country. In order to secure the monopoly of the American market under protection, the manufacturers of pile goods soon commenced their industrial activities on a large scale, and within a year or two of the new tariff régime a large number of plush and velvet manufacturing factories sprang up in the United States.¹ The loss of trade in the American market compelled some of the British manufacturers of pile goods to close their works and sell their machinery at extremely low prices in the United States. During the years 1893 and 1894 the American plush and velvet manufacturing industry passed through a period of depression on account of the previous over-production of inferior goods, and in the latter year the duties on pile fabrics were reduced to a rate equivalent to about 50 per cent. *ad valorem*, in order to make foreign competition more effective in improving the quality of the home-made goods. But as the British plush-manufacturing industry had already suffered serious decline, even this reduced tariff did not present any bright prospect of success to British manufacturers. Only one firm which produced highly specialised pile fabrics continued their manufacturing activities in this direction, but mainly for other than the American markets.²

¹ See Mason, "The American Silk Industry and the Tariff," p. 153.

² The following figures, showing the exports of pile fabrics from Great Britain to the United States, tell their own tale. The period under consideration is 1890-95, and includes the operations of the high and the reduced tariffs.

Exports of Seals, Plushes, Velvets, etc., from Great Britain to the United States, 1890-95, in thousand pounds sterling.

1890	380
1891	40
1892	38
1893	31
1894	24
1895	28

The high specific duties of 1890 completely wiped out the export

The export trade in dress goods, laces and embroideries from Great Britain to the United States was also affected by the tariff of 1890, but not to such an extent as that in plushes and velvets. Moreover, the depressing effect of the American tariff policy on the production of dress and piece goods in Great Britain was more or less counterbalanced by the extension of other outlets for British products, and therefore, on the whole, the broad goods branch of the British silk industry escaped the consequences which the plush and velvet manufacturing branch faced. For this reason it is not necessary to examine at length the effect of the American tariff policy on the broad silks branch of the British silk industry.

At this point we might devote some attention to the much-debated question of future protection for the British silk industry. We have already indicated that, in the absence of those comparative advantages which the new industry of the United States and the older industries of the Continent possess, the British silk industry has gradually lost its former position. Owing to continued attacks of foreign competition and to the consequent unprofitable nature of production, a large part of the capital invested in the silk industry has been withdrawn. We have observed in the last chapter that it is the tariff protection which enables the competing countries to make the best use of their economic advantages and to compete successfully with the British manufacturer. In the present chapter we have seen that the silk industry of the United States is in a sense "the child of protection." It is therefore obvious that in the case of the older countries the prosperity of the silk industry has been maintained under protection, while in the case of the new countries a prosperous silk industry has been built up behind a high tariff barrier.

The question which interests us most at present is whether the British silk industry would again flourish under protection. It is impossible to answer this question in a definite form, or to predict exactly the future of the British silk trade in pile fabrics from Great Britain, and even the reduced tariff of 1894 did not improve matters.

These figures have been quoted from the Report of the Tariff Commission of 1905, par. 3317.

industry under the influence of the tariff, but it is within our province to study the possible effects of a protective policy on the production of silk goods in Great Britain. Briefly speaking, a moderate import duty on silk fabrics of foreign origin would impart a fresh impetus to the silk industry, and would tend to prevent the unfair competition which in the pre-war days was a common feature of the foreigner's "dumping" policy. A small import duty of about 10 to 12 per cent. *ad valorem* on thrown silk would, in the beginning, raise the prices of the raw material to the manufacturer, but as it would act as a stimulus to the home industry, its ultimate effect would be to increase the output of the home thrown silks and to lower their prices. The prosperity of the throwing industry would, under favourable conditions, lead to the extension of the manufacturing industry, as the manufacturers would be able to obtain their raw material at cheaper prices. The American throwing industry may perhaps serve as an example in this case.¹

As regards the benefit of an import duty on silk fabrics and other manufactured goods to the British silk industry it is difficult to give a decision without referring to the nature of the commodity imported. The tariff on those goods which cannot be profitably produced in Great Britain can act only as a revenue-producing agent if they are imported in large quantities. Under this class come some of the Chinese and Japanese cheap piece goods. These goods are produced under extremely favourable circumstances, and are, as a rule, so cheap that even under the stimulus of high protection British goods would not be in a position to compete with them in prices. To the next class belong some of the highly artistic silk fabrics which are imported from France to satisfy a very limited demand, and cannot be profitably produced in Great Britain on account of the lack of highly skilled workers. The tariff on these goods would neither impart a stimulus to their production nor act as a revenue-producing agent, as they are imported in small

¹ Even with high wages, the American throwsters produce thrown silk as cheaply as any other throwsters in the world, and at present supply the greater part of the American demand.

quantities. The adoption of a tariff policy in these two cases would lead to an unnecessary rise in prices to the consumers of these goods, and though in the first case it would tend to raise the revenue, in the second it would serve no purpose at all.

The tariff would prove most effective in the case of those goods which are, and which can be, profitably produced in Great Britain. Under this class we may mention plain and fancy dress goods, tie silks, certain kinds of narrow goods, plain and fancy ribbons, silk goods for upholstery purposes, and ordinary braids and trimmings. All of these goods were formerly produced in large quantities and are at present manufactured on a small scale. An *ad valorem* duty varying from 15 to 25 per cent. on the imports of these goods would, firstly, act as a stimulus to their production in Great Britain, and, secondly, check their entry into the home market. Perhaps it might be argued by the advocates of free trade that, as these goods satisfy the larger part of the popular demand, an import duty would raise the prices of imported goods to the consumer. But this statement is based on the assumption that the tariff does not stimulate the growth of the home industry, and therefore it does not hold good if the imposition of an import duty is followed by an increase in the home production of competing goods. As we have shown previously, production on a large scale, resulting from a large increase in the demand for silk goods in the home market, results in lower prices. In other words, if the British manufacturers can secure a large and continuous business in the home market by means of protection they can produce goods cheaper than they do at present, and can thus relieve the consumer of a possible burden of the tariff.¹ It may therefore be assumed that in the long run the imposition of a moderate tariff (15 to 25 per cent.) on those silk goods which are, and can be, successfully produced in Great Britain would lead to an extension of the silk industry and would ultimately neutralise the effect of foreign competition. In so far as the present conditions are concerned, we may say that the

¹ This can be achieved provided the manufacturers do not combine.

adoption of a protective policy of this kind would not result in raising the prices of silk fabrics to the consumer.¹ After all, it is an experiment which is worth trying, not only for the individual economic interests of the silk industry, but also for the higher advancement of the arts of weaving, dyeing, and finishing, which are of utmost importance to all branches of the textile industries.

SOME CONCLUSIONS.

In the present section of this book we have examined the outstanding problems connected with the economics of the silk-manufacturing industry. A general review of these problems shows that the consumption of raw silk has followed an upward movement along with the developments in the methods of production. While in the middle of the last century the hand loom was the most important instrument of production, by the beginning of the present century the power loom had firmly established its position in the manufacturing industry. The introduction of labour-saving devices and the use of automatic machinery contributed a good deal to the increase in the world's output of manufactures of silk, and this increase naturally involved an increased consumption of raw silk.

The spirit of international competition also played a prominent part in the development of the silk industry in various countries. In Europe, Germany, Austria, Russia and Switzerland built up their silk industries in order to defeat French, Italian and British competition. In the New World the United States set up a high tariff barrier and ultimately succeeded in building up the most powerful silk industry in the world. The results of these developments are clearly shown by the steady increase in the world's consumption of raw silk and by the growing efforts of the manufacturing countries to maintain the prosperity of their silk industries.

The problems relating to the tariff protection have been fully discussed in the last chapter. The only conclusion

¹ For further reference and reservations see Note on p. 316.

which we might draw from our analysis of facts is that in almost all the silk-manufacturing countries there is a sense of insecurity which prompts the imposition of protective duties on foreign goods. In some cases the attitude of protection against foreign competition is based on legitimate grounds, while in others it rests on imaginary fears.

The last question dealt with in the present section concludes our economic discussion of the silk-manufacturing industry. The majority of the problems considered so far were of an economic and industrial importance, and did not touch upon the commercial organisation of the raw silk trade. In the next section we shall devote our attention to the latter part of the subject in order to examine at length the marketing and the distribution of the raw material.

NOTE.

In view of the financial and economic changes resulting from the imposition of a tariff on imported silk goods, it will be necessary to examine further the question of prices to the consumer under a possible tariff *régime* in Great Britain.

It has been clearly indicated in the last two chapters that, in the majority of the continental countries, the adoption of the protective policy resulted in the formation of "combinations" which succeeded in raising the prices of goods in the home market because of tariffs. On the other hand, there was free competition among the producers in the United States, and this led to the regulation of prices by the normal operations of demand and supply.

The two cases referred to in the last paragraph show that in Great Britain, under a tariff *régime*, the silk trade may either come under the influence of "combinations," or follow the course of free competition. But as the British silk industry, unlike the continental industries, is widely scattered and produces a large variety of goods, we are inclined to think that the formation of "combinations" would be extremely difficult, if not impossible.

PART V

CHAPTER XXI

CONDITIONING " OF RAW SILKS AND THE COMMERCIAL FUNCTIONS OF A CONDITIONING HOUSE

THE institution of conditioning and testing, which embraces the determination of the physical properties and the commercial utility of raw silk, plays a very prominent part in the organisation of the silk trade. Raw silk, as is well known, possesses a great hygrometrical power of absorbing or releasing a certain quantity of water. This quantity is governed by the external conditions to which the fibre is exposed, and with every variation in the surrounding atmosphere there is a corresponding variation in the percentage of moisture in silk. This property of silk engages the attention not of the merchant only, but of the manufacturer as well, and if ignored, causes a great commercial inconvenience, and sometimes becomes a means of fraud in the trade. From a purely industrial standpoint also, it presents serious consequences. The weight of the finished fabric is determined by the initial weight of the raw silk used for its manufacture, and if this contains more than the allowed percentage of moisture, the final calculation becomes liable to grave errors. It is therefore important that the manufacturer should know the exact weight of his raw silk and not the weight which includes an unknown quantity of water.

Experience has shown that the exact determination of this moisture cannot be left to the arbitrary discretion of buyers and sellers, and that it is only an established public institution which can independently and impartially give the desired information to the parties concerned. Moreover, the general interests of the silk trade demand the existence, in an important silk-manufacturing country, of a public institution for the prevention of frauds in individual cases. These were

some of the primary considerations which led to the establishment of conditioning houses in France, Italy, Germany, Switzerland, and the United States. In the later stages of their development, these institutions became the central sources of information on matters relating to the silk industry and trade.

In Europe, the most important conditioning centres are Milan, Turin and Como in Italy ; Lyons and St. Etienne in France ; Crefeld and Elberfeld in Germany ; and Zurich and Basel in Switzerland. In recent years, the New York conditioning house has come into great prominence, on account of the growing importance of the American market for raw silk. It might be observed, however, that the Lyons conditioning house is one of the oldest public institutions of this kind in the world, and the conditioning establishments in other countries have adopted practically the same methods of working as are employed in Lyons. For this reason we shall be justified in studying the general principles underlying this important part of the subject of commercial organisation from an account of the principal functions and the modes of their performance as adopted by the Lyons conditioning house.

The principal object of the Lyons conditioning house, or "Bureau de Conditionnement" as it is known in France, is to give the silk manufacturers full information as to the exact quantity of water contained in raw silk, and, by comparing it with the normal conditions of its humidity, to determine the true mercantile weight or the "conditioned" weight of silk. This establishment is under the control of the Lyons Chamber of Commerce, and is therefore designed to serve the commercial and industrial interests of the textile trades.

In addition to the determination of water contained in silk, the conditioning house gives full information concerning the real weight of silk exclusive of packing, etc., and other commercially useful properties, such as the size of the fibre, the loss in boiling off, the quality of winding, and the chemical and physical properties of raw silk.

The first process is that of exact weighing. The bale under consideration is broken open and the silk transferred to

another bale, after which the exact weight of the packing is taken down. The net weight of the bale is obtained by subtracting the weight of packing from the gross weight of the bale. Afterwards samples are extracted from different parts of the bale, approximately representing the average hygrometrical state of the rest of the bale. The proportional weight of these samples is generally about 1 to 1½ per cent. of the bulk of the bale.

These samples are then divided into three equal lots and weighed and re-weighed with the greatest precision. One of these lots is kept for eventual control; the other two are separately submitted to desiccation by exposure, which is done by hanging the skeins from the beam of a balance in stoves where hot air is circulating, until they gradually reach an absolutely dry state. All the water contained in the silk is driven off by the agents of desiccation, namely, temperature and ventilation. The temperature, as a rule, varies for each kind of textile according to its nature and strength. For silk, it may be pushed upwards to 140° C. without any risk of spoiling the fibre; for wool and cotton it does not exceed 110° C. As to ventilation, the more intense it is, the shorter the operation will be.

The absolute dry weight of the samples is then noted with the same degree of precision as before, and the relation between the original and the dry weights of the testing lots leads, by calculation, to the determination of the *absolute dry weight* of the bale. The "conditioned" weight is then obtained by adding to the dry weight the allowed proportion of water, agreed upon for each textile to contain in its normal state. This allowed proportion in the case of raw silk is 11 per cent.

Particulars relating to the net weight of the bale, weight of the sample before desiccation, dry weight of the sample, the absolute dry weight of the bale, addition of 11 per cent., and the "conditioned" weight of the bale, are given on a ticket delivered to the parties concerned. A duplicate of the same is kept in the conditioning house for reference.

The next operation, also carried on in the conditioning house, is "boiling off" or "decreusage de la soie," as it is

known in France. While the former process is important from a commercial point of view, this is useful for manufacturing purposes. As already stated, raw silk loses a certain amount of its weight after boiling off or degumming. This is due to the fact, that the exterior envelope of the silk thread is a kind of gummy matter which is soluble in a solution of alkali even greatly diluted, or in boiling soap water, and after the raw silk is subjected to the process of degumming, this natural gum forms a solution and leaves the silk white and bright.

The quantity of gum in raw silks varies according to their colour and origin. The main object of carrying out the process of "decreusage" is to boil off the gum and all other extraneous substances which may have been added to the raw silk submitted for examination, and to give the manufacturer information relating to the percentage of loss in weight thus obtained.

The actual operation of "boiling off" is carried out on systematic lines in the conditioning house. Some samples are taken from the bale and weighed absolutely dry (after the method explained above); these samples are then submitted to the action of two successive baths of boiling soap water, each containing a weight of soap equal to 25 per cent. of the weight of the silk. The time allowed is generally thirty minutes for each bath. The silk is then washed with lukewarm water, so as to get rid of the soap and the gum. This is then dried and weighed in its anhydrous state. The loss in "boiling off" is obtained by the difference between the absolute dry weights of the samples, before and after the operation.

The results of the experiment showing the loss in degumming are communicated to the party concerned. As silks are always boiled off before dyeing, it is necessary to know this loss in order to estimate the exact quantities handed over to the dyers or the weavers. With regard to the presence of extraneous matter other than the gum, the silk is subjected to chemical analysis which is the only means of ascertaining the amount and the nature of such substances.

The next important operation is that of size-testing which is much simpler in character than the two described above. It consists in determining the thickness of the thread, and in

recording the variations in the sizes of raw silks. The calculation is based on the weight of a fixed length of the fibre, and therefore a thread of silk which for the same length weighs double another is twice as coarse. The raw silk under examination is wound off on a swift, and a uniformly adopted length of 450 metres is measured off by means of an automatic meter fixed to the axle of the swift. This length is then weighed and expressed in half decigrams, that is $\frac{3}{4}$ of a grain. Thus when one says that a silk thread sizes 20, it means that 450 metres weigh 20 half-decigrams. This is now universally expressed in deniers which means the same thing; the process itself is known by the name of “titrage.”

The elasticity and tenacity of silk are determined by means of an instrument known as the serimetre. The principle involved is that of vertical extension by means of a very small stretching force. The silk thread is attached to the upper end of the instrument which is equipped with a graduated scale for reading the stretching force while the thread is in tension. At the lower extremity of the upper graduated scale in the same vertical plane, there is another index fixed along the length of the instrument. This index gives the movement of the thread while under tension. The stretching force is indicated by the upper scale and elongation is shown by the lower index. When breaking takes place, the instrument stops itself, the upper scale gives the breaking load by which tenacity is determined, the lower index shows the elongation, and thereby determines the elasticity of the thread.

Elasticity is expressed in percentage elongation of a thread of 50-centimetre length, and tenacity is expressed in grams weight of the breaking load. These results are related in a ticket in a similar way as in other tests, and a copy of this is handed over to the party concerned and another kept at the conditioning house.

The other tests conducted in the conditioning house are winding of raw silks, and the determination of twist in thrown silks, both of which are very useful from a manufacturing point of view. We have already stated that the winding qualities of raw silk are directly related to the winders' wages,

and to the output of thrown silk. The raw silk thread which breaks too often in winding raises the cost of production of thrown silk and also affects the winders' wages, when the latter are paid at a piece rate. The determination of twist in thrown silks is an operation which is conducted mainly for the benefit of the manufacturers of those goods which require highly twisted silks.

Chemical analysis of silk is conducted in a research laboratory which the Lyons Chamber of Commerce added to the conditioning house in 1884. This laboratory is a very important part of the institution, and is intended to supply the silk industry with all the scientific information which it may need.

The nature of functions performed by the Lyons conditioning house clearly indicates that the institution of conditioning and testing is a necessity for the welfare of the silk trade. While in the old system of commercial organisation there was a complete absence of testing the raw material by scientific means, in the modern system we find the adoption of methods which not only eliminate the chances of fraud from the silk trade, but also play an important part in the scientific and industrial advancement of the silk-manufacturing industry. The growth of the conditioning movement in a country like the United States, whose silk industry has shown remarkable progress during the last thirty years, is a clear indication of the fact that the existence of a public institution for testing purposes is an essential feature of the modern commercial organisation of the silk trade. It is surprising to note that the total number of textile tests of all kinds in the United States has increased from about 8,000 in 1908 to about 87,000 in 1917.¹ This enormous increase, the greater part of which represents the increase in silk tests, is a further testimony of the commercial utility of the institution of conditioning and testing. In Europe, the Milan conditioning house has achieved great success in recent years, and, at present, its activities are undoubtedly of a wider extent than those of the Lyons establishment.

It is obvious from the facts stated above, that the existence

¹ See the diagram showing the growth of testing in America, in the 46th Annual Report of the Silk Association of America, 1918.

of an institution of this kind in a silk-manufacturing country adds to the economic and commercial development of the silk industry and trade. On this ground, the establishment of a conditioning house in a country like India would not be without interest. Under the new industrial movement, efforts are being made to resuscitate and to develop the home industries so as to increase the national wealth of the country. There is no doubt that, in order to realise these industrial aims, it would be necessary to introduce new and productive industries into the country, but it does not mean that those industries which have declined owing to the lack of organisation should be ignored altogether. The silk industry in India is an example of that class of industries whose downfall has been due largely to the absence of co-operation and lack of organisation. The manufacturing branch of the industry which, as we have already stated, consumes annually about 4,000,000 lbs. of raw silk,¹ is scattered all over the country and does not possess any definite organisation to protect its commercial and industrial interests. The task of resuscitation, though difficult and complicated, can be accomplished only by an organised public institution which would impart fresh impetus to various branches of the industry.

In the first place, the presence of a conditioning house in a suitable locality would lead to a better control of the imports of raw silk into India. It would prevent arbitrary dealings in the silk trade and reduce the chances of fraud to a minimum. In the second place, the weavers and manufacturers of silk goods would be supplied with raw silk of a definite size and quality, with which they would be able to produce uniform goods for both the home and foreign markets. At present, the village weaver depends wholly on his personal judgment and produces cloth which varies in quality from part to part of the same piece. If the weaver knew that a raw silk of a certain denier and certain strength and elasticity would produce cloth of a certain definite quality, he would use the same raw material throughout, and produce a uniform fabric. In the third place, a testing institution, on the model of the Lyons conditioning house, would ultimately become the

¹ See Chapter XIV., p. 204.

source of scientific discoveries relating to the utilisation of new species of silk-producing moths of India, and thus the silk industry as a whole would tend to find a wider scope.

A very important consideration in this connection is that of financing the institution. Some critics would perhaps object to the establishment of a conditioning house in India on the ground that it would entail an additional burden on the Treasury, but a moment's reflection would show that this would not be the case. If the whole of the 4,000,000 lbs. of raw silk consumed in India were to be conditioned in the proposed conditioning house at a very moderate charge of a $\frac{1}{2}d.$ per lb., it would produce a gross revenue of over £8,000 a year.¹ Though it is impossible to state the exact amount of the annual expenditure without deciding on the actual size and the scope of the institution in question, it might be roughly estimated at about £6,000 a year for the present. According to this rough estimate, the proposed conditioning house would, under the present conditions, provide an annual balance of £2,000 for the payment of interest on capital invested in it, and also for the sinking fund.² An increase in the annual consumption of raw silk in India would result in a corresponding increase in the amount of annual gross revenue from the conditioning house, and after a number of years, the institution would probably begin to yield fairly large profits. But even if it were to yield no profits at all, its commercial and scientific utility would be a substantial return which if weighed by money value would far exceed the initial outlay.

In the present chapter we have discussed the first essential feature of the modern commercial organisation of the silk trade. The institution of conditioning and testing has now become a very important part of the system which characterises the economic organisation of the textile industries. The tendency to standardise textile fabrics in Europe and

¹ It might be noted here that, in Lyons, the authorities charge 10 francs per 100 kilos., that is about a penny per kilo. (2·2 lbs.) for conditioning raw silk. The minimum charge is 5 francs, even if the silk to be conditioned is less than 50 kilos. This price is paid half by the seller and half by the buyer.

² The capital invested in the conditioning house would not exceed £10,000, and therefore a 5 per cent. interest on capital would still leave £1,500 for the sinking fund.

America has resulted in an increased demand for raw materials of perfectly uniform qualities, and consequently in the scientific development of the conditioning houses which were originally intended only to safeguard the commercial interests of the silk trade.

The other important aspect of the commercial organisation of the silk trade, which calls for a close economic study is the system of marketing and distribution. In the next chapter we shall examine the principal features of this important aspect in order to find its relation to the silk-manufacturing industry.

CHAPTER XXII

THE MARKETING AND DISTRIBUTION OF RAW AND WASTE SILKS

THE silk industry considered as a whole, from the production of cocoons to the finishing of silk fabrics, possesses four distinct markets for its products and by-products. The first important market is that for cocoons, which, as we have already described in a previous section of this book, is still primitive in many ways and does not possess any of those characteristics which are found in modern developed markets. There are opportunities for speculation in it, but these are generally confined to export dealings in very large quantities. In France, and perhaps in Japan, the cocoon dealers occasionally "corner" the market in order to raise the prices, but these events do not take place very often.

The second important market is that for raw silk. This market, though not so highly organised as the cotton market, possesses some very interesting economic features. The complexity of the various grades and qualities of raw silks makes the former market more difficult to understand than the latter. The third market under consideration is that for waste silk (which is a by-product of both the producing and the manufacturing divisions of the silk industry). Lastly, the silk industry presents a fourth market for manufactured goods. It might be noted here that in order to avoid unnecessary complications, we are expressing the fourth market as the final market for all classes of manufactured goods, including spun yarns, thrown yarns, and silk manufactures whether made from raw silk or from spun silk. Strictly speaking, there is a separate market for each of these commodities, but as we do not propose to discuss here the marketing of manufactured or semi-manufactured goods, we have classed all into one.

As both the raw and the waste silks form the first raw materials for the spinning and manufacturing industries, it is necessary to examine the features exhibited by the system of marketing by which they are transferred to the actual consumers. The present conditions of marketing and distribution are widely different from those which prevailed two centuries ago. During the last two decades of the seventeenth century, and throughout the eighteenth century, raw silk was imported into the United Kingdom chiefly by the East India Company. A small part of the raw silk trade was in the hands of the "Turkey merchants," who obtained their supplies from the Levant¹; but the major part was conducted by the Company's agents in India. The policy of the East India Company was directed towards the acquisition of a monopoly in this branch of their commerce with the eastern countries, and, as in early days, the supplies of raw silk from Persia and China were first sent to India and then exported to England, it was possible for the Company to keep the entire trade in their own hands. Moreover, the large investment of capital by the Company in the production of raw silk in India proved so profitable in the beginning that the Company considered it best for their own interests to keep the private merchant out of the field. Although several changes were introduced into the system of buying the raw silk in India after the middle of the eighteenth century, and sometimes special commercial concessions were given to the resident agents, the exclusive right of exporting the raw silk to England was held by the Company till the year 1835.²

The system of marketing adopted by the East India Company was very simple. In the first place, there were no intermediate shipping agents, as raw silk was imported into the United Kingdom from India, China and Persia in the Company's ships and on the Company's account. In the second place, the supplies were received directly by the Company's officials on their arrival in London, and hence there was no room for the commission agents or merchants in the

¹ For full information on the East India Trade, see the author's "The Silk Industry and Trade," appendix.

² The Company's exclusive trade with India and China came to an end in 1833, but the provision of silk was carried on till 1835.

raw silk trade. London was the principal centre of distribution, not for Great Britain only, but for the Continent as well. It will be remembered that before the beginning of the last century, Spitalfields was a very prominent seat of the British silk industry, and London being the nearest port was the most convenient market for the distribution of the raw material. Raw silk was generally sold at the Company's auction sales. It is not definitely known whether the manufacturers bought their supplies through brokers or sent their representatives to these sales for purposes of buying on their behalf, but it appears from some of the old documents that the silk brokers played a very active part in the distribution of raw silk in those days. Probably the re-export trade to the Continent accounts for the activities of the brokers.

A very interesting point which draws our attention at this stage is the nature of the Company's commercial transactions. On account of the absence of cable facilities, and of the means of regular communication with the Far Eastern countries, there was no possibility of obtaining regular information concerning the supplies of raw silks available in the producing countries. The variations in the prices of silks in the London market depended firstly on the stocks which the Company could offer for sale at a particular period, and secondly, on the extent of the demand at that period. Obviously, therefore, there was not much room for speculation, and dealings in "futures" could not be made with safety as it was impossible to make a forecast of the future supplies. Moreover, the system of grading was very primitive, and, therefore, the buyers were, as a rule, unwilling to "buy ahead," except under special circumstances. On the financial side, all transactions were conducted on what were known as "Company's terms." Mr. Hollins Rayner describes these terms as "three months' prompt from date of purchase in the case of silk on the 'spot,' and three months' prompt from date of arrival in the case of silk bought to arrive."¹ It might be pointed out here that the term "to arrive" as used in the raw silk market simply indicated a future delivery and was different from the term "futures" as known in the cotton market.

¹ See Rayner, "Silk Throwing," etc., p. 21.

The period of three months allowed for the payment of the bills gave the buyers additional facilities for handling the raw silk. During this period the buyers were at liberty to complete the transaction by paying the full value of the raw silk bought or to take delivery of only a part of the total purchase by paying the due proportion of the total value. The system of buying and selling was on the whole quite simple and did not involve any risks.

As we have already stated, the exclusive trade of the East India Company with India and China came to an end in 1833; though the provision of raw silk was carried on till 1835. The removal of this monopoly gave rise to many changes in the system of marketing and distribution. The trade was now thrown open to merchants and dealers, and the former method of selling by auction was displaced by the new method of selling by arrangement. An improvement in the cleaning and grading of raw silk rendered possible selling by sample, and the introduction of this custom led to an increase in the number of middlemen. First of all, there was the merchant who imported supplies of raw silk from the East, and secondly, there was the broker who acted as an intermediary between the importer and the manufacturer. In some cases, the dealer formed a third party between the broker and the manufacturer, and thus played an active part in the distribution of the raw material. His chief function was to circulate samples and to receive orders from the manufacturing houses. The manufacturers and spinners were in a position to anticipate their requirements and to give an estimate of the season's total demand to the broker, but the latter was not in the possession of facts concerning the estimate of supplies available in the producing countries, and therefore based his calculations of prices on the existing stocks or on the expected arrivals. The absence of accurate information and the uncertainty of credit and banking facilities in the eastern countries prevented the economic organisation of the raw silk trade in the middle of the nineteenth century, and for a couple of decades after it. In many cases, these conditions encouraged blind speculation on the part of the dealers and thus rendered the market situation

unsatisfactory. The principal difference between the system adopted by the East India Company and that which followed the removal of their control was that, under the new conditions, there was no central authority and the trade was carried on by a large number of merchants, brokers, and dealers. There was no change in the method of conducting financial transactions; payments were still made on the "Company's terms."

It would not be out of place to mention here that London remained the centre for the distribution of Eastern raw silks in Europe till the end of the year 1869. The opening of the Suez Canal in that year caused an important change in the direction of the raw silk trade. While formerly the most convenient market for raw silks coming by sea from the Far East around the Cape of Good Hope was London, now the nearest European market was Marseilles. The natural consequence of the opening of the new route was that London no longer enjoyed the privilege of retaining the choicest selections of Oriental silks. The trade was thus diverted first from London to Marseilles, and then to Lyons, the seat of the French silk industry. The Italian silk industry also greatly benefited by the opening of the Suez Canal. Raw silk could now be imported from the East directly into the Italian ports, and then sent to Milan, the principal market for raw silk in Italy. The shifting of the market from London to the Continental centres was, therefore, a direct result of the change in the former trade route. The new situation caused a great decline in the extent of the British trade in raw silk, and the amount of the annual re-exports of raw silk began to fall after the year 1870. There was, however, one branch of the trade which still remained in the hands of the London merchants, and that was the re-export trade in silk to the United States.

It is interesting to find that the re-export trade in raw silks from England to America continued for more than a decade after the opening of the Suez Canal. According to Mr. Mason, during the "seventies," the imports of silk from London were still considerable, and, though declining in amount, averaged nearly \$1,000,000 a year for the decade.¹ But after the year

¹ See Mason, "The American Silk Industry and the Tariff," p. 26.

1883, the development of direct communication between America and the East led to the final decline of the British trade in raw silk. It was obviously more economical for the American merchants to import their supplies directly from China and Japan than to obtain them from London. The loss of trade with the United States seriously affected the position of the silk merchants in London, who gradually turned their attention to the importation of thrown silks and spun yarns. The outstanding effect of the various developments in the means of communication and transport on the direction of the raw silk trade was, that while London lost its importance as the central market for distribution, Lyons, Milan, and New York became the principal centres.

It is needless to follow in detail the history of the system of marketing of raw silks after the final decline of the London market. Our main object in giving the brief sketch of the system adopted by the East India Company was to indicate the basis on which the later system was built up. The developments which characterised the system of commercial organisation in the last decade of the nineteenth century were the outcome of the improvements in the means of communication, and of the introduction of more economical methods in the trade. The beginning of the present century saw remarkable progress in the perfection of the postal and telegraphic systems, which brought the various markets of the world together and rendered rapid communication possible. The organisation of the silk trade also underwent many changes, and followed the lines of general commercial advancement. In most cases, buying and selling became two independent functions of the trade and the system of distribution acquired a new form. In order to explain in detail the principal features of these developments, we shall now examine the system on which the present-day commercial activities of the silk trade are based.

THE PRESENT SYSTEM

It might be observed before considering the activities of the markets for raw and waste silks that, the enormous increase in the world's consumption of these two important

raw materials has had a considerable influence on the increase in the number of commercial functions. The increased demand for raw and waste silks necessitates the presence in a manufacturing country of merchants and brokers who have made a special study of the exact requirements of the silk manufacturers. Moreover, there are so many grades and qualities of raw and waste silks that it is impossible for an importer who deals in a large number of commodities to devote full attention to their classification. The complicated nature of the trade, arising out of the modern manufacturing requirements, demands a clear division of functions based on the nature of the commodities imported. For this reason, we find that, as a rule, the merchant or the broker who deals in raw silk does not include waste silk in his business, and *vice versa*.

Again, there is a further division between the commercial functions of the merchants and the brokers. Strictly speaking, the merchant's business is confined to the importation of silks from China, Japan, and other silk-producing countries. In a well-developed market, the next function is performed by the broker. It is the merchant who is the first buyer of the raw and waste silks imported from foreign countries, and who possesses all the available information concerning supplies. Then comes the broker who sells the imported supplies on commission to the manufacturer, and who possesses full knowledge of the existing demand. On the side of supply, the merchant performs as important a function as does the broker on the side of demand. Thus buying and selling represent two independent forms of commercial organisation in a highly developed and extensive market.

The economic functions of the merchant and the broker lead us in logical sequence to a consideration of supply and demand. Let us consider first the nature of supply, which is governed in the present case by the production of raw silk and waste in the silk-producing countries. We have already shown in the chapter on "The Economic Environment" that, the production of raw silk is not regulated by human agency alone. The natural climatic conditions display

different reactions in different seasons, and therefore, apart from human appliances, the supply of raw silk is largely dependent on the seasons. But it must be remembered that raw silk is produced in more than one country, and therefore, the world's annual output is not greatly affected by the failure of one or two small crops. There is no doubt that the supply of raw silk is not a constant quantity, and is subject to variations, but as nowadays it is possible to roughly estimate the amount of the crop, the available supplies are generally known to the trade a few months beforehand.

In a similar way, the demand for raw silk is not a constant quantity. While in the case of supply, nature regulates production, in the case of demand society plays a part which is analogous to nature's bounty as well as reaction. Social and economic conditions, such as an increase in the general prosperity of the consumers of silk fabrics, a sudden change in fashions involving the popular use of silks, and an enormous rise in the prices of fabrics made from other textile fibres, may increase the consumption of silk goods, and thereby raise the demand for raw silk. On the other hand, conditions, such as a reduction in the spending power of the consumers of silk fabrics, a general drift of fashions into cotton and woollen garments or the use of another cheaper substitute, may lower the demand for raw silk. But here, again, it must not be forgotten that the changes in the current fashions alone would affect only the manufacturing branches of the silk industry and not the demand for raw silk, since the decline in one fashion would be followed by the increase in another. From this point of view, the demand for raw silk is more constant than the demand for particular fabrics, as the raw material can be put to a multiple number of uses. The other economic influences which reduce the consumption of popular silk fabrics and consequently lower the demand for raw silk are observed only in abnormal times, and are not ordinarily taken into account by those who study the market conditions for the raw silk trade. We might therefore conclude that, although both the supply of, and the demand for, raw silk, are varying quantities, they can be generally determined to a fair degree of accuracy by the experts in the trade.

The next point in the present discussion which demands a careful study is the grading of raw and waste silks. We have seen that during the period of the East India Company's trade, there was no definite method of grading the raw silk, and the imported supplies were generally sold in bales on inspection. Some improvements were made in this system after the removal of the Company's control, but nothing substantial was done till the last decade of the nineteenth century. In 1897 a conditioning house was established in Yokohama by the Imperial Japanese Government, with a view to improving the quality of the raw silk thread and to standardising the length of the skein. This effort resulted in success, in so far as the quality of the thread was concerned, but it did not improve the system of grading which remained as complicated as before. It is surprising to notice that, even under the present advanced conditions of commercial organisation, raw silks are sold in the market under hundreds of different names, each representing a particular chop mark or the name of the reeling filature. In many cases, the shippers in China and Japan attach arbitrary names to the bales without referring to the quality or grade of the raw silks contained in them. The raw silks exported from Canton are sent in large skeins which have to be subdivided into small skeins to suit the winding frames of the British and American mills. Sometimes they have to be re-graded in order to distinguish the coarser sizes from the finer sizes. Similar defects have been observed in the importations of waste silks from India. Two or three different qualities are packed in one bale without any grading, and the white and the yellow varieties are both mixed into one.

The lack of grading and definite standards in raw and waste silks presents serious difficulties not only to the raw silk trade, but also to the manufacturers of silk goods. In the first place, it affects the rapidity of commercial transactions. The first principle underlying a proper system of grading is a quotation apart from samples. A silk merchant in London or New York, for instance, can cable an order to his agent in Shanghai without seeing the raw silk he proposes to buy if the grade representing the quality, the size, the colour, the

winding test, etc., is quoted in these centres ; so that an organised method of grading reduces the period during which a transaction can be completed to a minimum. In the second place, the proper grading introduces economies in the cost of handling silk, by causing a reduction in the number of middlemen between the producer and the consumer. The method of buying and selling by samples alone involves the services of additional agents, and thus raises the cost of marketing the raw material. In the third place, the absence of grading increases the cost of preparing the raw silk for the manufacturing processes. We have pointed out in a previous chapter that, in the case of waste silk, the process of " picking " and sorting unnecessarily increases the cost of production of the spun yarns. Similarly in throwing, ungraded or badly graded raw silk firstly causes an unnecessary delay in the execution of an order, and secondly increases the labour bill. And lastly, the absence of systematic grading creates an unsound business proposition for the producer and the exporter of raw and waste silks. It is a matter of common knowledge that when two or three different grades of a raw commodity are sold as one, the price obtained for the mixed grade is generally based on the price of either the lowest or the medium grade ; so that the exporter suffers a financial loss because of the lack of grading. This loss is, as a matter of course, transferred to the producer of the raw commodity, who is also responsible for the want of a proper system in production.

From the point of view of the organisation of raw silk markets, systematic grading is one of the first conditions of commercial success. Of late, the subject has received considerable attention from the American trade, and a number of investigators have put forth suggestions for the establishment of an international system of silk classification. Mr. Douty, a well-known silk expert, points out that " such a classification as Grand Extra, Extra Classical, Best Classical, Classical, etc., or as Double Extra, Best Extra, Extra, Best No. 1, No. 2, etc., without any further description, is exceedingly indefinite and the subject of continuous controversy." ¹ Those who

¹ " Silk Essays," published by the Silk Association of America, 1914, pp. 46, 47.

have had an insight into the raw silk market must be in complete agreement with this view. Apart from the four effects which we have explained above, the present system leads, in some cases, to fraudulent practices in the trade, and thus causes occasional disturbances in the market. Obviously therefore, it is highly desirable that an international system of silk classification should be established. It would be a valuable contribution to almost all the silk markets of the world, but the American market being the largest would benefit most.

Considering the difficulties presented by this problem, we cannot but agree with Mr. Douty's suggestions as to the method of international classification of raw silks. We have already indicated in the last chapter that, the physical properties of raw silks can be accurately determined by means of delicate instruments, and that the uniformity of these properties throughout a particular consignment is a matter of great importance to the manufacturer. It is therefore possible to construct a system of classification with the accurate measurement of the principal properties of raw silk as the basis.¹ Further, such characteristics as colour, lustre, and cleanliness could be graded by establishing standards of references—a method which has been successfully adopted by the American cotton industry. The method suggested by Mr. Douty is undoubtedly very sound. "It would," he holds, "eliminate from the trading the cancellation of orders on trivial pretexts regarding quality and make the enforcement of contracts much easier." The suggested system is based on scientific grounds and cannot fail to improve the present conditions of marketing if used as an international standard.

Next to grading, the collection and circulation of information regarding the conditions of supply and demand and quotations is a fundamental essential of an organised market. Unlike the cotton markets, the raw silk markets in Europe do not possess a central medium of information relating to the daily quotations. The British market, on account of its small size, cannot be expected to create a special Silk

¹ "Silk Essays," published by the Silk Association of America, 1914, p. 48, and also 49.

Exchange, or to publish daily circulars indicating the variations in prices. But there is apparently no justification for the Lyons market to keep the silk trade uninformed of the daily events. In so far as it is known to us, the only circular giving particulars of the monthly deliveries of the Lyons conditioning house, and of monthly variations in the prices of European and Asiatic raw silks is the one published in the first week of every month by Messrs. Chabrières, Morel & Co., of Lyons.¹ There is no doubt that, in the absence of a central source of information in Europe, this private circular performs a very useful function and keeps the trade in touch with the monthly changes in quotations, but it must be remembered that the information given at such long intervals cannot sufficiently represent the changes that may have taken place from day to day or even from week to week. Perhaps it might be argued that the raw silk markets in Europe are not subject to quick fluctuations and, therefore, do not stand in need of daily information about facts affecting prices and supplies; but then there is another aspect of the question which undermines the validity of this argument. It is the unstability of prices in the exporting countries.

Those who have done business at the Silk Exchange in Yokohama know the exact significance of quick fluctuations in the prices of raw silks. We are informed that one cannot put too much reliance in the prices prevailing at a particular time of the day, as they may go up or down the next moment. There is so much room for speculation in the Silk Exchange that the exporters representing or buying for large firms in New York or Lyons find it difficult to follow the movement of prices even after their long experience in the business. For this reason it is essential that the importing houses in Europe and America should receive immediate information about the fluctuations in prices. But in the absence of a central source of information, this important commercial function is performed by private cable quotations received only by large importing firms.

This brings us to the controversy which arose a few years

¹ All quotations are given in francs per kilo, at 90-100 days.

ago¹ out of a proposal for the creation of a Silk Exchange in Lyons on the lines of the Wool Exchange at Roubaix and Tourcoing, and the Cotton Exchange at Havre.² As is usually the case with proposals of this kind, there was a good deal of controversy on the subject, and each interested party advanced its views on the advantages or the disadvantages of such an exchange.

The principal arguments in favour of this movement were based on the assumption that the capital invested in the raw silk trade was inadequate to bear the burden of the ever-increasing world's crop. It was pointed out that production was keeping ahead of consumption, and enormous though the latter was, the capital embarked in the trade had not kept pace. The creation of an exchange would, it was maintained, by encouraging and facilitating speculation, attract outside capital, which would lessen the burden then weighing so heavily on the trade, and would tend to keep up prices.³ Further, it was held that, by the daily fixation of quotations for each quality, the proposed exchange would impart a stability which was then lacking, on account of the uncertainty of prices, that often varied according to the dealer's pleasure.

Studying these arguments from an economic point of view and applying them to the present conditions, we find that the absence of a central authority to settle the prices of raw silks is undoubtedly a very weak point in the present system, and therefore, the establishment of an exchange would very likely result in a reform in this direction. As regards the argument relating to the encouragement of speculation for purposes of attracting outside capital, it is very doubtful whether the creation of an exchange would serve this end. As a matter of fact, it is well known that the unrestricted speculation of 1907 resulted in a subsequent depression in the silk trade. At other times also, uncontrolled speculation has been known to have hastened the downward tendency

¹ The controversy started in 1909, though the original proposal was made long before that.

² See Diplomatic and Consular Reports, France, Annual Series Nos. 4483 and 5108, for the years 1910 and 1913.

³ These arguments are given in D. & C. Reports, No. 4483, p. 31.

of quotations, and to have introduced outside stock jobbers into the market, whose main interest centred in the gambling side of the business. Under these conditions, an exchange established with the object of attracting outside capital for purposes of speculation cannot have a healthy effect on the market, unless proper safeguards are provided against the evil influences of speculation.

It might be observed in passing that although this movement was discussed first in 1909 and then in 1913, it has not been put into a practical shape so far. The Lyons silk manufacturing industry has been avowedly hostile to the creation of a Silk Exchange on the ground that it might lead to increased speculation in silk, and some of the silk merchants have also advanced a similar argument. There is no doubt that an institution of this kind has both advantages and disadvantages, but it is possible to reduce the number of the latter to a minimum by laying down certain rules and regulations governing the procedure of marketing.

So far we have discussed the essential features of an organised silk market and have shown the importance to the trade of a rational system of grading and of a central agency of information about facts affecting prices. We shall examine now the actual working of the British raw silk market, in order to see in what manner do the essentials explained above influence the organisation of the trade. But before considering this case, we might note here that although the system of marketing is the same in London as in Lyons, in so far as the theory is concerned, there are one or two practical differences which arise chiefly out of the differences in customs or "usages" as they are generally known.¹ These usages are regarded as a code of general acceptance; in some cases they are compiled and condensed in a lucid and accessible form, in others they remain an unwritten law.

Let us now consider briefly the present system of marketing and distribution of raw and waste silks in Great Britain. The first thing we notice is that London is still the central market

¹ An essential difference between the London and Lyons markets is, that, in the latter, the weight invoiced to the purchaser is the "conditioned" weight. This is due to the fact that silk is delivered free in Lyons and conditioned in the Lyons conditioning house.

for raw silks in England, while Manchester is now the principal market for waste silks. The reason for the shifting of the waste silk market from London to Manchester is quite obvious. The concentration of the spinning industry in the central area ¹ makes Manchester the most convenient centre for the distribution of the raw material. As regards the manufacturing branch of the British silk industry, the situation is entirely different. Its scattered character excludes all possibilities of establishing a geographically convenient market for the raw material, and as London has long held the traditions of an important raw silk market, there is no economic reason for shifting the market to some other place.

The next point worth observing is that, the British raw silk trade still retains the "terms," of the East India Company. Raw and waste silks are bought and sold on the "Company's terms," or the "London terms," as they are commonly known. During the war, however, a slight modification was made in the period of maturity of the drafts, and instead of three months as formerly, the period was extended to four. But this was due entirely to the shipping difficulties.

As regards buying arrangements, the usual method of procedure is that, first of all, certain standards of the raw material are fixed by the manufacturers or the spinners, who, as a rule, anticipate their requirements and buy "to arrive." The manufacturers transmit their orders to the brokers or to the merchants, who cable the offers to the selling agents in Shanghai, Canton, or Yokohama, according to the quality of the raw material required. On account of the uncertainty of quotations, the merchants do not like to import raw or waste silks on their own account, and in most cases prefer to cable instructions to the Far Eastern agents against definite orders. The exporter in Shanghai and Canton cables the latest quotations to the importer in this country and allows four days' time-limit for the final settlement of the business in question.² If the importer cables acceptance within the time-limit the exporter is bound to accept the order, but if there is

¹ See Chapter XV. for the towns included in the central area.

² It might be observed that all quotations are c.i.f. either London or Manchester, and, during the war, included war risks insurance as well.

no reply from the importer, no further steps are taken by either of the parties.

It is needless to describe here the method of shipping the goods from the Eastern countries and of receiving them in England, as the facts affecting these two parts of commercial organisation are practically the same in all trades. The only point which calls for attention is that, all matters arising out of a serious difference between the imported goods and the standards agreed upon beforehand, are decided by arbitration, and that allowance is always made for damage caused to the bales by sea water.

Now it will be instructive to draw some conclusions from the brief account of marketing we have given in the last few paragraphs. In the first place, the absence of an international system of grading necessitates the fixation of standards by individual members of the trade, and thus not only causes delay in the execution of orders, but also increases the cost of marketing. In the second place, the consumers of the raw material, that is the manufacturers and the spinners, buy "to arrive," in order to protect themselves against a possible rise in the prices of raw and waste silks. And similarly, the merchants buy from the exporters against orders from brokers and manufacturers, in order to avoid risks involved in a possible fall in prices. In other words, in a comparatively small market, the general tendency of the parties interested in the trade is to protect themselves against possible fluctuations in prices. But, as we have remarked previously, in a large and well-developed market, although this tendency exists, it does not exist to such an extent as to force the merchants to buy only against orders from brokers. In Lyons, Marseilles and Milan, for instance, some importing firms adopt the policy of stock-holding, and base their calculations on the future conditions of supply and demand. The final result of this policy however depends on the direction of the prices of raw silks. If the prices rise and the market becomes favourable for the sellers, the dealer who holds stock, makes profits; and on the other hand, if prices fall, he incurs losses.

Another significant fact which might be pointed out here is

that, the present machinery of marketing and distribution receives its motive force from the services of the broker and the merchant. The former relieves the silk manufacturer of commercial anxieties, and thus enables him to devote more attention to the organisation of his factory. In order to illustrate this point, let us suppose that the manufacturer adopts the system of "direct buying," that is without the help of a broker. Under this system, he will have to create a buying department and keep a regular staff for this purpose, or else the chance of receiving good supplies of raw silk will be remote. But the creation of a buying department depends upon the size of the business. In the case of a large manufacturing firm, this could probably be done without great financial burden, but in the case of a small firm, the adoption of this policy would certainly result in greatly increased expenditure, and therefore the latter would consider it advisable to pay the broker a commission and then remain free from all responsibility. As the majority of manufacturing houses are small, the system of direct buying does not seem to be economical. Moreover, an expert knowledge of the demand for various kinds of raw and waste silks enables the broker to introduce new varieties to those manufacturing establishments in which they have not been previously used.

In conclusion, we must repeat that the keynote of an efficient mechanism of distribution should be economy—a principle which is sometimes ignored by dealers, whose selfish interests lead to unrestricted speculation. It is true that speculation plays an active part even in some of the highly organised markets, such as the cotton and wool markets, but it must be remembered that the dangers of speculation in those markets are now greatly reduced on account of the improved methods of grading and the movement towards specialisation in buying and selling which tends to maintain stability in prices. The raw silk markets in Europe have not yet developed to such an extent as to be able to avoid the risks of unrestricted speculation, and to control the market fluctuations. The last consideration indicates that, under the present market conditions, the most important duty of the

broker is to specialise in the exact nature of demand and that of the merchant to acquire an expert knowledge of the problems affecting supply. The fulfilment of these two conditions would lead to an improvement in the system of distribution.

The present chapter concludes our study of the economics of the silk industry. There are, however, many other problems in addition to those we have discussed in this book, which call for attention, but on account of their complicated character they demand an exclusive survey and cannot be conveniently dealt with in a single volume. For this reason we shall leave the detailed study of such problems as the problem of comparative efficiency in production, the systems of payment of wages prevailing in different silk-manufacturing countries, and the problem of labour organisation, for future investigation.

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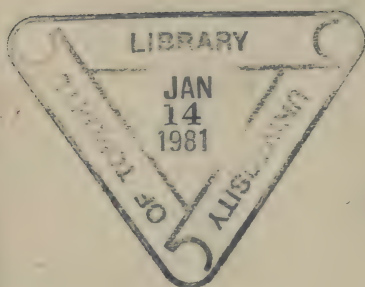
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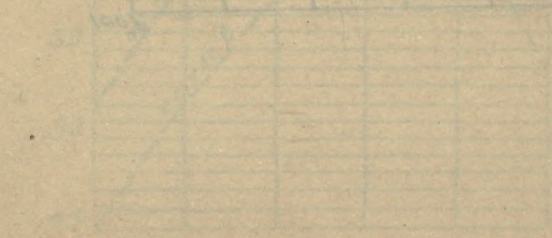
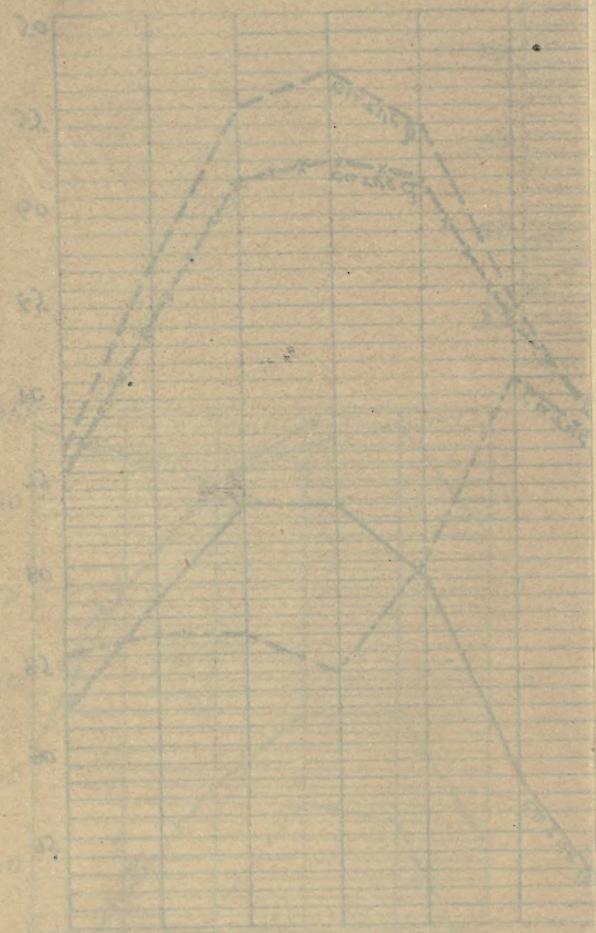
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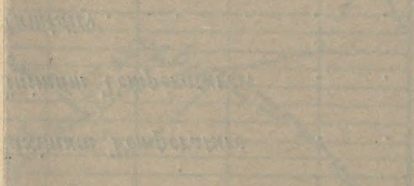
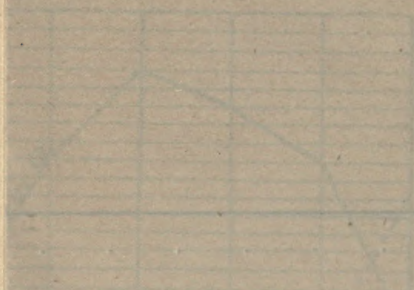
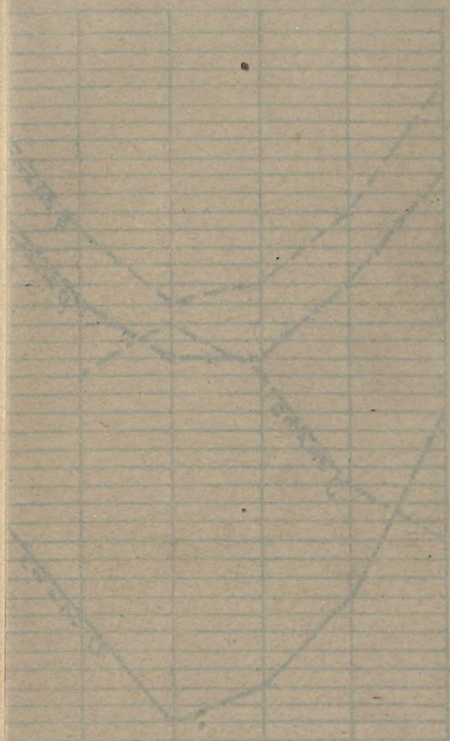


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